

The Power of Focus: Unlocking Creative Insight and
Overcoming Performance Barriers

by

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B.A., Brock University, 1987

B.Ed., University of Western Ontario, 1988

M.A., Royal Roads University, 2001

A Dissertation Presented in Partial Fulfillment
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Abstract

Challenges, problems, and conflicts can be the seeds of growth, or the seeds of destruction. It seems worthwhile to develop skills for addressing and resolving life challenges in ways that promote growth. Problem solving skills are a component of any performance challenge whether athletic, academic, professional, or personal. However, the cognitive and physiological resources and processes associated with problem solving have the potential to act in ways that both enhance and inhibit effective problem solving and performance outcomes. The threat appraisal mechanism, the subconscious process of evaluating whether a challenge poses a threat, is designed to preserve the individual but can also work to interfere with an individual's capacity for creative problem solving. Focus, a process capable of galvanizing an individual's attention and energies toward a singular purpose, can erode performance just as powerfully by drawing energies away from performance goals. Insight into the interactions and interdependencies of underlying cognitive and physiological mechanisms and principles comprising the problem solving process would better inform the design of facilitative performance interventions for a variety of realms including business, academic, athletic, and interpersonal.

The following experimental and quasi-experimental field study explored the relationship between cognitive appraisal, attentional focus, problem solving, and goal

attainment. The research examined the influence that threat focus, assumption focus, goal focus and 'integrated' focus had upon coping strategies, cognitive stress appraisal, and performance outcome on problem solving tasks. Shifts in focus were achieved using questions designed to direct thinking.

Qualitative and quantitative analyses were conducted in the form of three separate but interrelated experiments. The first experiment compared the impact of three focusing interventions on problem solving rate and approach on a variety of insight problems. The second experiment evaluated a refined intervention against a control group on the same tasks. The final experiment applied the refined intervention within an organizational field setting and evaluated the impact of the intervention on problem solving approach and outcome when faced with challenges related to a workplace injury. Outcome was based upon correct solutions in the lab and sustainability of solutions in the field.

Analysis of variance results demonstrated that the focusing intervention significantly and positively affected problem solving rate, outcome and approach in the lab and moderately and positively affected problem solving outcome and approach in a workplace setting.

The research has implications for other individual, team and organizational settings suggesting that performance on a wide variety of problems may be improved by utilizing an integrated focus.

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The Power of Focus: Unlocking Creative Insight and Overcoming Performance Barriers

Dedication

Deepest appreciation and gratitude to my team:

Craig White

J. Barton Cunningham

James MacGregor

Tanis Farish

*Thank you for helping me to focus, integrate, process my fears,
and sustain my stupid passion.*

CHAPTER 1 INTRODUCTION

Statement of the Issue

Challenges, problems, and conflicts can be the seeds of growth, or the seeds of destruction. It seems worthwhile to develop skills for addressing and resolving life challenges in ways that promote growth. Problem solving skills are a component of any performance challenge whether athletic, academic, professional, or personal. However, the cognitive and physiological resources and processes associated with problem solving have the potential to act in ways that both enhance and inhibit effective problem solving and performance outcomes. The threat appraisal mechanism, the subconscious process of evaluating whether a challenge poses a threat is designed to preserve the individual but can also work to interfere with an individual's capacity for creative problem solving. The focusing process, a process capable of galvanizing an individual's attention and energies toward a singular purpose, can erode performance just as powerfully by drawing energies away from performance goals. Insight into the interactions and interdependencies of underlying cognitive and physiological mechanisms and principles comprising the problem solving process would better inform the design of facilitative performance interventions for a variety of realms including business, academic, athletic, and interpersonal.

Most intriguing in the problem solving literature, and perhaps most useful, is the concept of creative insight. Insight is described as the 'out of the box' or 'aha!' solution to a problem. A historical example of creative insight occurred within the Mann Gulch fire of 1949. Mann Gulch occurred when a wildfire in the Helena National Forest, Montana, United States, spread out of control and ultimately claimed the lives of 13

firefighters. Foreman Wagner Dodge led the team towards the Missouri River. The fire, however, spread faster than anticipated and had already cut off the path to safety. The men had to turn around. When Dodge realized that they would not be able to outrun the fire, he started an escape fire and ordered everyone to lie down in the area he had burnt down. The other team members hurried towards the ridge of Mann Gulch instead (achieving heroic speeds in their desperate attempts to escape!). Only two of them, Bob Sallee and Walter Rumsey, managed to escape through a crevice and find a safe location, a rock slide with little vegetation to fuel the fire. Two other members survived with heavy injuries and died within a day. Only Dodge was able to acknowledge that they could not outrun the fire and look to the challenges that this reality created for him: the prospect of being burned. His younger crewmembers remained focused on the threat: escaping the fire. Accepting the threat as part of his reality perhaps allowed Dodge to focus upon the goal of survival: How does one survive the fire given that one cannot outrun it? Perhaps with this enlarged focus he was able to generate the truly insightful solution: the need to remove fuel and reduce the chance of being burned by the fire. Ironically the two other survivors benefited from the same principle Dodge applied in his solution; the rocky slope they reached had no fuel for the fire. The concept of creative insight as it relates to problem solving offers a framework for exploring and understanding how best to enhance problem solving skills.

Purpose

The present study proposed to increase understanding into the ways in which attentional focus influences problem solving and performance outcomes. Insight into the mechanisms governing attentional focus may assist in the development of interventions to

facilitate performance and problem solving. Knoblich, Ohlsson and Raney (2001), in a study of problem solving found that ‘gaze’ predicted problem solving ability. They concluded that a problem solver’s focus (in the case of matchstick problems upon either the number or the operand) was a critical factor in the problem solving process. Studies in performance and problem solving have demonstrated that focusing on perceived threats or barriers diverts attention from goal achievement thereby detracting from performance (Eysenck, 1992; Hayes, Barnes-Holmes, & Roche, 2001; Jones & Swain, 1992; Wulf, McNevin, and Shea, 2001). Likewise, though goal oriented focus has been shown to be more facilitative to problem solving and performance (Beilock et al., 2004; Wulf et al., 2002), efforts to focus solely on the goal when a perceived barrier exists have proven ineffective because the act of replacing the negative with the positive diverts energy and focus from the task at hand (Beilock, Afremow, Rabe, & Carr, 2001).

The theoretical model guiding the study proposes that optimal attentional focus may be achieved by ‘re-composing’ a problem, challenge or barrier by integrating perceived threats with performance goals. An integrated focus enlarges the focus and offers a goal orientation while still addressing the perceived threat. For instance, using a ‘threat focus’ an organization facing the challenge of a competitor may perceive the competitor as a threat because they advertise lower prices. Typically, organizations with a barrier or threat focus would attempt to compete with or eradicate the threatening competitor by lowering prices. However, such a threat focus may result in a compromise of quality, service, support for workers, infrastructure. In this way, the threat itself does not represent the problem but does hold clues to the actual challenge. The problem that this threat actually creates is a potentially reduced market share. Therefore, the goal of

the organization is to achieve market share despite the threat of the competing organization, not to lower their prices. While it may be impossible to eradicate the competition or compete with lower prices, it is still possible to compete for market share. An integrated focus would result in a more precise and productive representation of the challenge (in this case, market share) thereby generating more precise and productive solutions (in this case, competitive product or 'quality' rather than pricing). The study therefore also suggests that true creativity occurs most productively after the problem is represented precisely. If a problem is represented unclearly or as merely a threat, attempts to generate creative ideas or solutions will prove specious.

The integrated focus process reflects the model of insight problem solving in that insight involves representing the problem in such a way as to unlock creative solutions. The following experimental and quasi-experimental studies sought to more fully understand the process of insight and what facilitates a precise representation of a problem. The study explored the relationship between cognitive appraisal, attentional focus, problem solving, and goal attainment, and examined the influence that facilitating an assumption focus, goal focus, and 'integrated' focus had upon coping strategies, cognitive stress appraisal, and performance outcome on a problem solving tasks requiring insight.

Objectives

It is proposed that leverage for improving outcome in the face of any stressor lies within a person's focus. When a stressor is easily resolved, attentional focus shifts back to the goal supporting performance outcome. Threat focus has been shown to debilitate performance while goal focus has been shown to facilitate performance. Individuals who

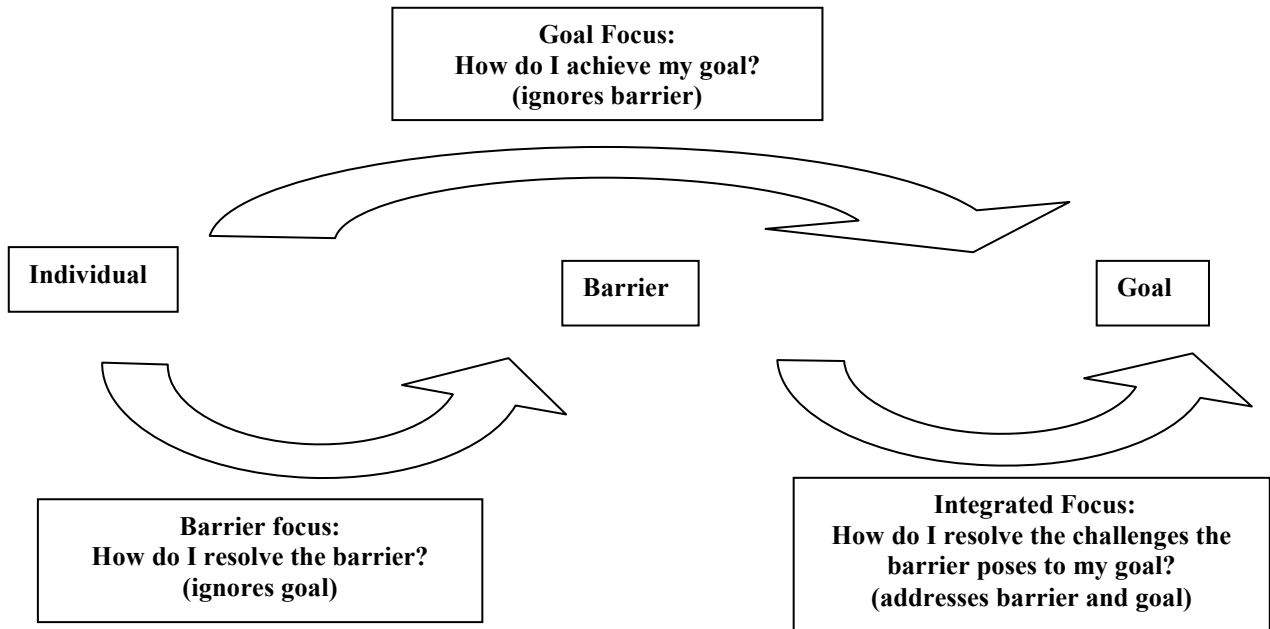
cannot accept that they have no control over a performance barrier may be at greatest risk for failure because attention is diverted from performance to threat as the individual attempts to eradicate, change or control the threat. Acceptance is believed to be the key mediating variable for behavioural change (Bond & Bunce, 2000; Bond and Bunce, 2003; Livneh & Antonak, 1997), but acceptance of one's lack of resources to change a threat may be the central mechanism determining coping strategies and outcome, as opposed to acceptance of negative thoughts, feelings, or sensations associated with the threat. Influencing people to accept a lack of control may prove challenging. Therefore, an intervention that facilitates an enlarged focus by linking threats to goals may be more effective at helping individuals to penetrate barriers and unlock creative insight.

The objectives of the present study were to conduct two lab and one field experiment within the context of insight problem solving. Attentional focus research and training has been conducted mainly with single samples (i.e. test anxious students, athletes, problem solvers). It was the aim of this study to test the theoretical principles of attentional focus within two problem and performance contexts (laboratory problems and the challenges of a workplace injury) in an attempt to generalize attentional focusing theory across samples. The experiments examined the impact that different kinds of attentional focus interventions have upon problem solving performance approach and outcome. Ansburg and Dominowski (2000) in a series of experiments designed to test insight problem solving training procedures, argued that elaboration and constraint relaxation training procedures taught participants how to process problem for underlying structure 'By encouraging solvers to go beyond the details of content, one can increase the likelihood that they will access useful, but inert knowledge' (p. 50). However, the

training given to participants in such experiments assumes that insight depends upon 'shaking loose' knowledge that is otherwise inert. The present study sought to build upon existing theory in creativity and insight problem solving by untangling the process of insight itself further in order to gain an understanding of how insight itself is unlocked along with the knowledge and creativity that accompanies the insight mechanism.

Secondly, the experiment explored the relationships between attentional focus, cognitive appraisal, and goal attainment. In particular, the study explored the mediating variables operating within the cognitive appraisal, attentional, and performance/problem solving processes. It was hypothesized that cognitive appraisal of a threat has a causal influence upon the dependent variable (performance outcome) because focus acts as a mediating variable. That is, the individual's ability to focus on the goal of a task varies with the individual's performance outcome. Implications for intervention design are significant. Helping an individual see the link between perceived threats and personal goals should serve to enlarge focus from threat focus to and integrated barrier + goal focus and result in enhanced performance compared to individuals who remain solely threat focused (Figure 2).

Figure 1
The Integrated Focus Model



For instance, if an individual is attempting to increase mobility within 2 weeks of a back injury, and the barrier is the physical pain that she must endure in order to do so, rather than trying to increase one’s control over the pain by ignoring or blocking it out (threat focused), it may be more effective to first identify and then resolve the ‘symptoms’ of the problem, or the problems pain can cause relative to the goal of mobility: including the threat of re-injury due to improper movement, a desire to stop, a reduction in effort in order to reduce the pain. Shifting focus to ways in which knowledge of physiology, focus, persistence, and effort can be sustained in order to achieve mobility without incurring re-injury may prove much more productive in terms of recovery than attempts to ‘push through’, ‘ignore’ or ‘succumb’ to the threat of the pain itself. In terms of intervention design, it may prove most productive to utilize the power of focus by

facilitating a focal shift, rather than attempting to engender acceptance of negative feelings associated with the threat, or acceptance of a lack of power over the threat.

Hypothesis

Those who perceive performance barriers as threatening develop a barrier focus and cope by focusing on attempting to change, avoid, or control the barrier, a focal orientation shown to compromise problem solving ability and performance. It is hypothesized that individuals are better able to let go of their barrier focus (i.e. competition, lack of funding, rainy conditions, an injury) if they are able to focus on threat ‘symptoms’ or the relationship of a threat to the goal of the problem task (i.e. decreased market share, lack of support for programs, lack of control on the field, inability to work and earn money). An integration of barrier and goal focus may enable an individual to perform more effectively by creating a link between perceived threat and identified goal. A more integrated focus would then acknowledge the perceived threat while sustaining a goal focus thereby representing the problem in terms of goals rather than in terms of threats or barriers. Problem solving literature in the areas of accounting (Choo & Tan, 1995; Choo & Trotman, 1991; Christ, 1993; Chung & Monroe, 2000; Lehman & Norman, 2006; Wright, 2001), academics (Gagne et al., 1993), foreign policy (Sylvan & Voss, 1998), and medicine (Bordage, 1994; Boshuizen & Schmidt, 1992; Rickers et al., 2003; Schmidt, Norman & Boshuizen, 1990, 1993; Van de Weil et al., 2000) have shown that problem representation is a critical component to effective problem solving, and have illustrated that conciseness of problem representation varies with experience level. It was hypothesized that a more precise representation of the problem would provoke more creative and sustainable solutions than either a barrier or

goal focus alone. Barriers provide clues to a more precise representation of the problem by helping a problem solver link to the actual goal of the problem. A barrier is only threatening because it threatens a goal. Addressing the barrier is important because negative information receives more processing and contributes more strongly to the final impression than positive information (Baumeister et al., 2001). Therefore utilizing the barrier as a path to the goal of the problem not only generates a more precise definition of the problem, it addresses the barrier itself.

Knoblich et al. (2001) prefer the hypothesis that “initial representations are inappropriate or misleading rather than incomplete, and thus have to be deactivated or inhibited rather than extended or elaborated” (p. 10), but the present study would argue that rather than turning one’s gaze from the barrier and ‘deactivating or inhibiting’ a representation, it would be more productive to follow one’s gaze through the barrier, to the goal. By inquiring more deeply into the initial barrier focused problem representation it is possible to penetrate the barrier and arrive at the actual goal of a challenging task. By penetrating the barrier to the goal, one generates a more integrated representation of the problem and subsequently unlocks more creative and relevant solutions that also address the threat. It is hypothesized that an integrated focus would enhance both problem solving ability and outcome on a variety of problem solving tasks.

It is also hypothesized that a series of questions will serve as a focusing intervention. Questions cause individuals to respond cognitively thereby subtly influencing an individual’s focus. The intervention designed for the study is comprised of a series of questions designed to shift the individual’s focus from and through the perceived barrier to the actual challenge or problem that the barrier poses. In this way, the

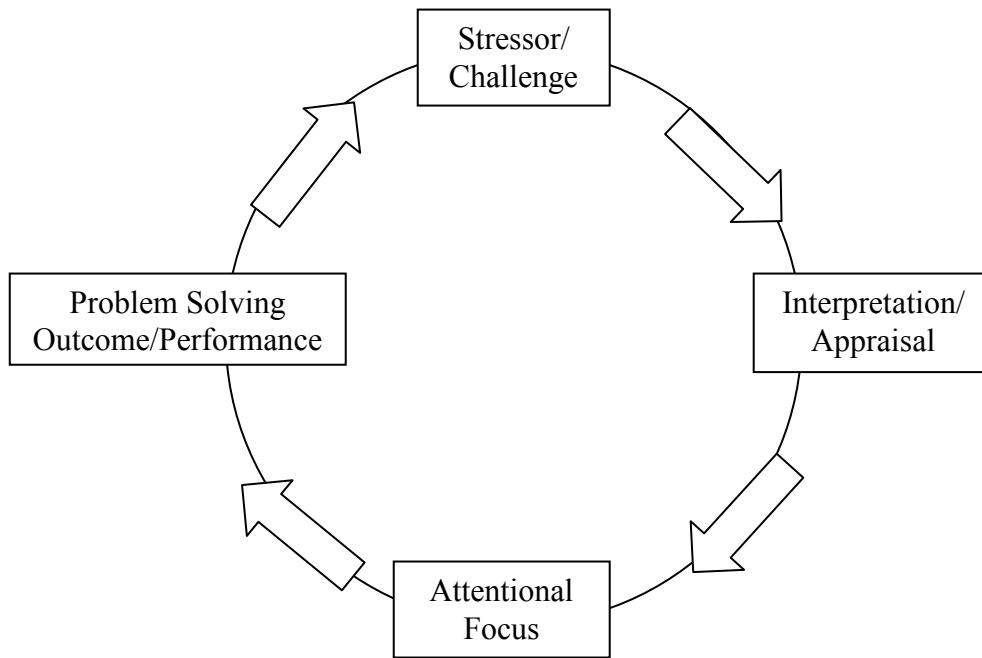
questions lead the individual's focus through the barrier to the core representation of the problem.

Conceptual Framework

Guiding the study is a conceptual framework which deems performance as a problem solving process and proposes that problem solving is a function of the relationships between challenge or stress, cognitive appraisal, and focus (Figure 1).

Figure 2

Mediators and Moderators of Problem Solving and Performance



Creative Problem Solving and Performance

A society committed to the search for truth must give protection to, and set a high value upon, the independent and original mind, however angular, however rasping, however socially unpleasant it may be; for it is upon such minds, in large measure, that the effective search for truth depends.

~~~ Caryl P. Haskins

Creative problem solving (CPS) skills are an important component of performance in a variety of realms. Problem solving is inherent to effective decision making, innovation, and organizational development tasks (Ketchen, Snow & Street, 2004; Nutt, 2002, 2004) as well as individual physical, artistic, and mental tasks (Durand-Bush & Salmela, 2002; D'Zurilla, & Sheedy, 1992; Kovác, 1998; Pugh, 1991; Wang & Horng, 2002; Wanish, 2000). Discussion abounds as to what creative problem solving involves (Callahan, 1991; Khatena, 1982). Those familiar with the recurrent waves of interest in the field will note an emerging framework that emphasizes divergent thinking coupled with convergent thinking (Cropley, 1999; Runco, 2004). Researchers have come to agree that training CPS involves facilitating both divergent and convergent thinking skills beginning with the father of brainstorming, Alex Osborn (1963). However, others have since added to the literature on divergent thinking including: Bill Gordon (1956; 1961) and George Prince (1970) and their Synectics approach; Edward deBono (1971) and the Six Hats or Lateral Thinking approach in which creativity is described in terms of new ideas *and* new perceptions; Isaksen and Treffinger (1985) and Isaksen and Dorval (1994) who focus on evaluating ideas using a Criterion Matrix; Rickards (1990) who explores intuitive and structured techniques for 'choosing wisely'; and finally those who emphasize the importance of problem finding as it impacts convergent thinking and problem resolution, (Basadur et al, 1982, 1992, 2000a; Kershaw & Ohlsson, 2004; Rickards & Puccio, 1991; Runco & Chand, 1994). The sustainable solution is one that shows insight by illustrating a profound understanding of the problem at its core, and sustainability by offering a practical and enduring application. Facilitating sustainable

solutions depends upon how the problem is defined; however, a productive problem definition is the result of a process.

The current study proposed that all three sources of problem solving difficulty (perception of the problem, processing of the problem information, and prior knowledge) are linked by interpretive mechanisms and as such may be resolved by facilitating a cognitive shift in problem interpretation and focus in order to re-compose the problem in a more definitive and productive way.

### *Focus, Creative Problem Solving and Performance*

When one door closes, another opens; but we often look so long and so regretfully upon the closed door that we do not see the one which has opened for us.

~~~ Alexander Graham Bell

Focus can be a powerful tool for helping an individual to achieve goals but can also interfere with a person's efforts at goal attainment. Clearing one's mind of distractions and focusing upon a clear goal is thought to be an important aspect of performance (Locke & Latham, 1990). However, we do not always have control over our focus. Though one might try to focus on a particular goal, at times the mind cannot help but focus on something else. At the same time, what we choose to focus upon can be unproductive or debilitating to performance. Easterbrook (1959) in his 'cue utilization theory' demonstrated that hyper-vigilant focus toward threatening cues can impede performance because it draws focus away from performance relevant cues. If threats can be resolved easily, then focus can be returned to the task; however, if threats persist or are uncontrollable, valuable focus is indefinitely diverted from the task resulting in decreased

performance. Focus can be a help or a hindrance to problem solving or performance of any kind.

Attentional resources directed toward avoidance, resignation, control, or ‘denial of feelings’ are no longer available to address the barrier, nor decide upon and complete the correct course of action for a successful outcome (Bond & Hayes, 2002; Hayes et al, 1999). In their study of mental health and work performance, Bond & Bunce (2003) found that “people who do not try to avoid or control psychological events have more attentional resources, engage in less avoidant behaviour, and may learn how to they can most effectively use the control that they have to promote their mental health” (p. 1064). Perception and focus may also play a large role in generating and resolving barriers to return to work after illness or injury, and consequently in predicting disability and return to work outcome as well as enduring outcomes for individuals struggling to overcome a workplace illness or injury. Current psychological interventions assert that acceptance of the negative feelings or anxieties that accompany a stressor is facilitative to rehabilitative outcome (Hayes, 1987; Bond & Bunce, 2003; Bond & Hayes, 2002); however, not everyone interprets anxiety as debilitating, and therefore not everyone would benefit from accepting their negative emotions as a means to moving past them. Within a mental health study, negative feelings may in fact be the primary threat to treatment outcome. In order to generalize the concept of acceptance; however, it may be more fruitful to shift focus to acceptance of perceived lack of control (acceptance meaning ‘tolerance’, ‘acknowledgement’, and ‘recognition’ as opposed to ‘surrender’, ‘giving up’, or ‘acquiescence’). If one considers anxiety to be yet another reality accompanying a stressor, the result of a threat appraisal and a physiological readiness mechanism, it is

possible that anxiety will meet with a similar cognitive appraisal process. In fact, sports psychologists have found that people appraise anxiety in much the same way that they might appraise any stressor or challenge (Jones, 1992; Jones & Swain, 1995; Jones, Swain, & Hardy, 1993); that is, one would primarily appraise anxiety as a threat or a non-threat, and, if deemed threatening, secondarily appraise one's capacity to respond to the threat posed by the anxiety. If one finds one's perceived inability to control the anxiety to be threatening, then one would focus on trying to increase one's control over the anxiety, rather than focusing on the actual threats or problems that the anxiety may bring.

Optimal attentional states have been viewed as an outcome rather than a process and therefore do not tell us much about the underlying process of optimal attentional focusing (Hatfield & Landers, 1983). Attentional focusing processes seem to occur at the subconscious level and have remained relatively unexplored in cognitive psychology (Kissin, 1986). Unconscious processing has been allocated to the domain of psychodynamics. In Erdelyi's (1985) words, subconscious operations are an "obvious and fundamental feature of human information-processing" (p. 59). Problem solving, writing, listening, learning, and so on often do not require conscious awareness (Lewicki et al., 1997). Some researchers have shown that attempting to actively or consciously control the process involved in a skill can degrade performance by attempting to put the execution of a skill under the 'control processing' mechanism when it typically falls within the scope of automatic processing (Kimble & Perlmutter, 1970; Singer, 1988, 2002). Examples illustrating how conscious monitoring of a process interferes with automaticity include piano playing (Keele, 1973), typing (Langer & Imber, 1979), and a motor/visual laboratory task (Baumeister, 1984). It has been suggested that optimal

attentional processes may be achieved when physiological arousal is channeled into automatic processing rather than control processing (Ravizza, 1984). However, the threat appraisal and cognitive bias processes also appear to occur at the level of automaticity and, as studies demonstrate, it remains unclear how to go about channeling arousal. The present study proposed that shifting focus from threat to goal can be achieved by helping the individual see the link between threat and goal.

Stress, Focus, Creative Problem Solving and Performance

When it is dark enough, you can see the stars.

~~~ Charles A Beard, American Historian (1874-1949)

Stress or challenge has been shown to impact focus, causing the individual to focus unproductively and debilitatively on, among other things, the stress itself (Jones & Swain, 1992, 1995; Jones, Swain, & Hardy, 1993a, 1993b), associated negative emotions, thoughts or images (Hayes, Barnes-Holmes, & Roche, 2001), the step-by-step processes of a task (Wulf, McNevin, and Shea, 2001), or distractions such as the crowd or external expectations (Eysenck, 1992) (Figure 1). According to the theory of cognitive appraisal, an individual first appraises or interprets a potential performance stressor as threatening or not, then appraises his resources for resolving the threat (Lazarus & Folkman, 1984). Myriad personality, temperament, socio-cultural, and genetic factors may be influencing the mechanism of cognitive appraisal (Cloninger, Przybeck, & Svrakic, 1993; Penley & Tomaka, 2002); however, leverage for changing personal or biological factors may be elusive. Svrakic, Svrakic, and Cloninger (1996) found that their factors of temperament were invariant despite socio-cultural influences. The present study is only concerned with how attentional focus may influence any given cognitive appraisal to enhance performance outcomes.

According to the theory of cognitive bias, if an individual perceives a performance barrier to be a threat to self or performance goals, he will attend to the barrier in an effort to resolve it thereby diverting attention away from the goal (Eysenck & Calvo, 1992; Mathews & Mackintosh, 1998). Effective problem solvers appear to benefit from a facilitative interpretation or acceptance of stressors or performance barriers. Accepting or positively interpreting barriers and stressors appears to free up the cognitive resources required to attend to the task at hand supporting a goal focus as opposed to a threat focus (Hayes, Barnes-Holmes, & Roche, 2001; Jones, Swain, & Hardy, 1993b; Macleod & Mathews, 1988). However, the mechanism that enables individuals to accept or positively interpret stressors and thereby sustain a more productive focus still eludes researchers.

Mental functions and cognitive processes are terms often used interchangeably, the term cognitive tends to have specific implications - to mean such functions or processes as perception, introspection, memory, imagination, conception, belief, reasoning, volition, and emotion--in other words, all the different things that we can do with our minds. A specific instance of engaging in a cognitive process is a mental event. In naturalistic settings, people are constantly confronted with words that have different possible meanings, facial expressions that are equivocal, and entire social situations that can lead to various interpretations. Research has identified robust emotion-congruent effects on the interpretation of ambiguous stimuli. This notion has been tested empirically in the past decade (Byrne & Eysenck, 1993; Eysenck, Macleod, & Mathews, 1987; Halberstadt, Niedenthal, & Kushner, 1995; Mathews, Richards, & Eysenck, 1989; Niedenthal, Halberstadt, & Setterlund, 1997; Pincus, Pearce, & Perrott, 1996; Richards,

Reynolds, & French, 1993). That is, people's interpretations tend to reflect their current emotional state.

At the same time, Mogg et al. (1990) found that there was no consistent evidence of a cognitive bias associated with trait anxiety and the effect of the stress manipulation did not appear to be mediated by state anxiety. It would seem that an individual's interpretation of a 'stressor' hinges more on perception and its myriad of contributing factors, than upon emotional state. While debilitating anxiety may result from a negative cognitive bias of a stressor, anxiety in itself and alone, does not appear to be the cause of the negative interpretation.

By extending the theory of stress and coping, it is hypothesized here that when an individual perceives herself as lacking in resources to manage a threat, her perceived lack of control, and not necessarily her anxiety, becomes the new challenge and focal point. If she deems her perceived lack of control to be threatening or problematic for any reason, this would hypothetically cause her to fixate upon increasing resources for managing the threat, and impede any kind of response to the particular threats the barrier itself generates. If, on the other hand, she accepts her lack of control, deeming her lack of resources to be a benign reality, she would be free to move her focus back to the threat itself and consider options for its resolution.

In some studies, the concepts of control and coping have resulted in confusing results. It is assumed that people with an internal locus of control believe that their own actions determine the rewards that they obtain, and those with an external locus of control believe that their own behavior doesn't matter much and that rewards in life are generally outside of their control. However, as Susan Folkman (1984) herself states in her analysis

of coping, stress and personal control, “believing that an event is controllable does not always lead to a reduction in stress or to a positive outcome, and believing that an event is uncontrollable does not always lead to an increase in stress or to a negative outcome” (p. 848). In their study on fear of crime, locus of control and coping, Caputo and Brodsky (2004) found that locus of control had an association with problem-focused coping in the opposite direction, that is, those who believed that they had little control over crime had a more problem-focused approach. Likewise, in their study of a non-curable health disorder called Tinnitus, Sirois, Davis and Morgan (2006) found that those people who make “the appropriate shift in focus” by surrendering control over the uncontrollable aspects of a chronic illness and adopting control over the more manageable aspects of one’s health (i.e. symptoms) reflect a situational type of power that facilitates psychological adjustment (p. 123). However, the prospect of ‘surrendering’ or ‘letting go’ of control can seem even more threatening to an individual than the perceived threat itself. How to facilitate such a ‘letting go’ remains a challenge.

Surrender or ‘letting go’ may not be a productive or realistic pathway for improving problem solving performance. It is hard to imagine letting go of something unless there is something equally stable or reassuring to grab on to. The current study proposes that facilitating a more productive focus involves an integrated approach as opposed to a divisive approach. Rather than turning our gaze away from perceived threats, it may be more productive to enlarge the frame and put threats into a goal perspective. Threat and goal appear to be linked; a barrier is only perceived as such because it poses a threat to a deep value or goal. Helping people to see the link between their perceived threats and the goals that are threatened may facilitate a powerful focus and enhance

problem solving performance not by turning away from perceived threats or even reinterpreting them, but by addressing threats from within a goal oriented perspective

### Applications of the Integrated Focus Model

The question arises whether a re-composition of the problem by reframing a perceived threat as part of the goal reality might enhance performance with any variety of problem or task. To illustrate how the process of problem composition might work in a number of challenge and performance scenarios, the following examples are provided:

#### *Example 1*

An example of attentional focus shift within NASA occurred during the early days of the space program. Scientists tried to solve the problem of heat of re-entry by devising a substance that could withstand heat, meeting with repeated failure. Perhaps after accepting defeat, scientists were forced to explore the problem from a new perspective, it becoming clear that the problem was not to ‘withstand heat’ (threat focus) but to accept heat as part of the goal reality and in this way focus on how to enable the capsule to adjust to the temperature change (goal focus). Their ultimate solution – the ablative heat shield that burns away as the space vehicle penetrates the atmosphere, taking the heat with it – turned upside down their original problem definition of ‘how to withstand the heat.’

#### *Example 2*

A large healthcare facility was operating with success in a large urban centre (Caldwell et al., 2007). The centre employed over 1000 doctors and several thousand nurses and staff. A smaller health center opened within the same area, offering good care at a reduced rate, and soon lured a good portion of the clientele away from the larger

centre. Focusing upon reducing their rates would have put the larger organization at a disadvantage considering the greater overhead costs they sustained. A threat focus would have resulted in an unsustainable strategy for addressing the threat the smaller centre presented. One can imagine the implications of cost cutting upon both employee and client satisfaction. Instead, the larger centre explored the challenge more deeply discovering that the problems the smaller centre created were a reduced market share. A more integrated focus found the larger centre addressing the threat to clientele that the smaller centre's reduced rates presented, while keeping in focus the goal of market share. The large centre decided that to increase market share, they would focus on quality. Their new mandate of offering 'quality care at a moderate rate' found commitment from organizational members and was implemented over 2 years with a positive response from clientele.

### *Example 3*

A man was faced with the problem of a broken branch from a nearby tree dangling ominously over his roof. After repeated attempts to cut the branch off he finally accepted that he could not reach the branch in order to cut it off. An initial threat focus found him focusing on the threat of the branch itself breaking and destroying his roof. Once he accepted that he could not cut the branch off as part of his goal reality, it became clear that the problem was actually to protect his roof and therefore the actual threat was the weight of the branch. One imagines his thought processes following these steps:

**Is it a threat? What is the threat?**

- Yes, the branch might fall and break my roof

**What are your solutions?**

- I'll cut it off, I'll not care, I'll get help, someone else should have done this long ago, this is just my luck, I'm sure I'll figure it out eventually...(threat focus becomes cutting the branch, focus becomes lack of resources to resolve the threat)

**Are these working?**

- Yes (problem solved)
- No, I can't reach it (failure)

**What is the threat now?**

- I can't cut it off so it will likely fall (threat focus).

At this point it is hypothesized that the individual assumes a threat focus (I must cut the branch off) because he has constructed a barrier (I can't cut the branch off because I can't reach it) based upon his assumptions that the branch must be cut off at its source in order to prevent it from falling. If the individual were to inquire into the barrier further, it would lead him to the actual challenge or goal of the situation:

**What is threatening about that or what worries/concerns you about that?**

- The falling branch might break my roof

**What is the real challenge then?**

- How to protect my roof or keep the branch from falling on it (integrated focus)

**What are some creative solutions for achieving this goal?**

- Perhaps I could cover my roof, or cut the branch off in the middle to reduce its weight, or tie the branch to the tree so that it doesn't fall.

Asking an individual to identify the problems that the perceived threat creates for them will penetrate the threat and lead the solver to their actual goal and their actual challenge. The threat is connected to the goal because the goal characterizes the threat as such. Asking the solver what worries them most about the perceived threat (what makes it a threat in the first place) will also link them to their goal, and create a more integrated focus that frames the challenge in terms of goal while still addressing, rather than ignoring, the threat (Figure 2).

### Significance of the Research

The development of a focusing intervention to enhance problem solving processes would have wide applications for a variety of problem solving scenarios including academic, athletic, physical, organizational, and interpersonal. As well, a tool designed to unlock creative insight would have far-reaching implications including the generation of more innovative and sustainable solutions to social, economic, political, and environmental challenges.

## CHAPTER 2 LITERATURE REVIEW

The following literature review explores components of the conceptual framework outlined above (Figure 1): effective problem solving is a necessary component of successful performance and is a function of cognitive appraisal, stress, and attentional focus. The first section of the literature review surveys the research in the area of problem solving and problem solving training programs. It is hypothesized that focus plays a role in how well an individual is able to represent a problem. An attentional focusing strategy or training procedure that addresses a barrier or threat in terms of its relationship to a goal and thus facilitates an ‘integrated focus’ may support effective problem solving and performance, thus the second section of the literature review surveys attentional focus theories and training programs. Finally, while an attentional focusing intervention may support problem solving outcome in a lab scenario, it is important to also test the problem solving model in a realistic or field setting. Workplace injury is considered a challenge and problem solving process for many and carries with it a certain level of perceived stress. The final section will review the literature on problem solving strategies associated with workplace injury and pain as an excellent example of a problem solving process in a realistic setting.

### Theories of Problem Solving

#### *Divergence and Convergence*

Divergence and Convergence are popular principles within the realm of problem solving. Scott, Leritz, & Mumford (2004) performed a meta-analysis of creativity training programs and, based upon 70 studies, found that successful programs were likely to focus on both idea generation and cognitive skills training. The emerging challenge in training

CPS has been how to facilitate the divergence necessary to cast a wide attentional net, along with the convergence that enables one to choose well among many alternative solutions. But, while a correlation may exist between divergent thinking or remote associations and creativity in solving problems (Feldhusen & Clinkenbeard, 1986; Harrington, Block & Block, 1983; Mednick, 1959), creative insight does not appear to be a function of divergent thinking alone. For instance, Fontenot (2001) found that creative problem solving skill depended upon a combination of fluency in data and problem finding (number of ideas and problem representations), flexibility in problem finding (variety of ideas and problem representations), and quality of problem statement (degree to which the needs and motives were satisfied as established by the owner, goal and constraints of the final problem statement). The ability to think of many ideas, or to link remote ideas, does not necessarily mean one is creative (Feldhusen & Clinkenbeard, 1986). Likewise, restructuring a problem representation (Ansburg, 2000) alone will not ensure that a solution will be found or even that a person will notice that an impasse has been broken (Ormerod, MacGregor, & Chronicle, 2002). However, the qualities of divergence and remote association may signify a capacity for creative insight because of the underlying principle they represent: The capacity to think divergently may be operationalized by the same interpretive mechanism that enables a person to represent a problem effectively, that is, a facilitative interpretation that is free from cognitive biases, assumptions or constraints.

### *Problem Representation*

The missing piece in understanding how people solve problems creatively seems to be that of how an individual arrives at his problem representation and whether or not it

is possible to facilitate this process more effectively. Some cognitive psychologists have shown that the interpretation of a problem mediates the processing of the problem information by generating a cognitive bias. The cognitive bias then acts to moderate the utilization of information cues or prior knowledge (Eysenck & Calvo, 1992; Easterbrook, 1959; Mendelsohn & Griswold, 1967; Mendelsohn & Lindholm, 1972) as well as the ability to make ‘remote associations’ (Ansburg, 2000; Mednick, 1962). If an individual interprets a problem as ‘beyond his locus of control’ or ‘threatening’ for whatever reason, he becomes hypervigilant to threat cues, and his attention narrows, (Ansburg, 2002; Eysenck & Calvo, 1992; Hertel, Mathews, Peterson, & Kintner, 2003; Mogg, Mathews, Bird, & Macgregor-Morris, 1990) resulting in a limited capacity to utilize cues as they are presented. The solver focuses on premature solutions or representations of the problem making it difficult to see the problem for what it truly is (Ormerod et al, 2002). If one is too busy looking at the obstacles, it is impossible to see the openings. It is not so much what causes the imposition of problem constraints that concerns us, but rather that such an imposition indeed takes place and how it might be possible to resolve imposed constraints or at least navigate past them to a clarified view of the problem.

The purpose of the current work is to provide empirical evidence that all three sources of problem solving difficulty (perception of the problem, processing of the problem information, and prior knowledge) are linked by interpretive mechanisms and as such can be resolved by facilitating a cognitive shift in problem interpretation. “The majority of mistakes in ordinary thinking (outside technical matters) are mistakes in perception. Our traditional emphasis on logic does little for perception. “If the perception is inadequate, no amount of excellence in logic will make up for that deficiency” (deBono,

2005). Perception is a matter of directing attention. If you are not looking in the right direction it does not matter how clever you are, you will not see what you need to see. By beginning with solution constraints, and the underlying problems that exist within these (lack of control, lack of sustainability), the solver may be more willing to let go of his initial approach to solving the problem.

Max Wertheimer, together with Kurt Koffka and Wolfgang Köhler, was the founder of Gestalt theory. In his (1912) "Experimentelle Studien über das Sehen von Bewegung" he examined the phenomenon of apparent motion, where a pair of alternately flashing lights stimulate a percept of a single light moving back and forth. Wertheimer recognized that this phenomenon revealed a constructive or generative aspect of perception. Gestalt theory would suggest that interpretation is constructed based on a number of factors that influence an individual's perception. In terms of problem solving, how one interprets and constructs the problem, what one perceives as the heart of the problem, determines how one might go about searching for and seeing potential solutions.

Many have experienced the phenomenon in which one has a problem and goes about searching for something to fix the problem. Or, in the words of one colleague, "I don't know what I am looking for but I know it is somewhere on this workbench." There is a certain level of openness to potential solutions in such an endeavour that comes with clearly representing the problem. For instance, Getzels (1975) provides an excellent illustration of how problem construction sets the problem solver up for 'choosing wisely': An automobile is traveling on a deserted country road and blows a tire. The occupants of the automobile go to the trunk and discover that there is no jack. They define their dilemma by posing the problem: "Where can we get a jack?" They look about, see some

empty barns but no habitation, and recall that, several miles back they had passed a service station. They decide to walk back to the station to get a jack. While they are gone, an automobile coming from the other direction also blows a tire. The occupants of this automobile go to the truck and discover that there is no jack. They define their dilemma by posing the problem: “How can we raise the automobile?” They look around and see, adjacent to the road, a barn with a pulley for lifting bales of hay to the loft. They move the automobile to the barn, raise it on the pulley, change the tire, and drive off (p. 38).

Let us examine how the two groups constructed the problem. If one’s cognitive appraisal of a problem results in an interpretation of the problem as ‘outside of one’s locus of control’ or ‘threatening’ in any way or for any reason, it is likely that the solver will impose an implicit constraint upon the problem (i.e. we must have a jack to solve this problem). Various explanations point to different constraints (prior experience, problem display, assumptions), but all share the view that the locus of problem difficulty is centered on the solver’s constrained representation of the problem (MacGregor et al, 2001).

In explicating the interpretive or appraisal process, it may become clear as to how we might facilitate problem representation free from constraints. If a person appraises the problem positively, he is more likely to represent the problem free from constraints (i.e. we need something to lift the car). Such a phenomenon has been observed in a variety of challenging or problem solving situations including cognitive (Eysenck, 1992), artistic (Csikszentmihalyi & Getzels, 1970; Rump, 1982; Suwa, 2003), and athletic (Easterbrook, 1959; Jones & Swain, 1992, 1995; Eubank, Collins & Smith, 2000; Mathews & MacLeod, 1994). A positive interpretation of the problem leads to an unconstrained representation

of the problem. A lens through which the solver will represent the problem more clearly places him in a position to notice appropriate solutions. Representing the problem to accurately reflect the situation then supports a 'preparation of mind' or capacity to recognize the insightful solution when it appears.

In previous research, creative endeavors were coupled with feelings of anxiety (Eiduson, 1962; Maddi & Andrews, 1966). Clapham (1997) reviewed possible mechanisms through which beneficial effects of training might occur, and concluded that they can be attributed to programs' ability to foster:

- (a) development of appropriate thinking skills;
- (b) acquisition of positive attitudes to creativity and creative performance;
- (c) motivation to be creative;
- (d) perception of oneself as capable of being creative;
- (e) reduction of anxiety about creativity; and
- (f) experience of positive mood in problem-solving situations.

It is apparent that this list goes beyond that of thinking skills, and encompasses attitudes, motivation, self-image, and similar factors. Isen, Daubman & Nowicki (1987) found that positive affect facilitated creative problem solving while negative affect seemed to pose little or no detriment. However, negative affect generated by a sad or disturbing movie may have little impact on how an individual interprets a problem distinct from the movie experience. More specifically, Carlsson & Smith (1997) found grave anxiety to be associated with low scores on creative problem solving tests, but also found high creatives to possess more anxiety and to use a greater number of defense mechanisms

than low creatives. High creatives have been shown to have a higher level of basal arousal.

In keeping with the work of Jones and Selye, poor performance may have less to do with anxiety or arousal levels than with the individual's interpretation of his arousal levels. Furthermore, others have illustrated that it is not anxiety per se that causes a narrowed attentional focus, but rather our interpretation of the arousal we experience in the face of a challenge or problem, what Eysenck (1992) and Eubanks et al (2000) term cognitive bias and Jones & Swain (1992; 1995) call anxiety direction. One may theorize that the individual's level of debilitating anxiety may act to constrain the attentional resources available to solve the problem or even to see the problem. Without attentional breadth of focus, (Ansburg and Hill, 2003) remote associations are not possible and insight problems more difficult to solve. Every problem causes some degree of arousal because it poses a challenge to the human system. Depending upon the nature of the individual, whether trait anxious or confident, and the sociological factors impacting the individual at the time, the arousal will become debilitating anxiety, or facilitative arousal (Jones, anxiety direction). As such, the emotional processes underlying the solving of the problem will then impact the neurological and thus the cognitive processes (cue utilization, remote association, social differentiation, cortisol levels, threat hypervigilance, attentional narrowing, cognitive processing bias) hindering or helping the individual's capacity for insight and thus for creative or innovative action.

The larger question appears to be whether positive interpretation of the problem and resulting attentional breadth can be facilitated, whether it is possible to help an individual 'throw the interpretive switch.' It makes sense that one would reach for what

is most familiar or seek to control the situation as quickly as possible when threatened. In a problem solving situation, threat interpretations would limit the person's ability to see the problem and result in a reluctance to break from a familiar frame, a problem representation that reflects an external locus of control (such as the lack of a jack in Getzel's flat tire problem), or solution statements formulated in place of problem-identification statements (a jack is actually a solution, not the problem), (Clinton & Torrance, 1986). Forster and Friedman (2001) and Higgins (1997) suggest that a focus on security, a risk averse, vigilant processing style impairs creativity because it causes attentional narrowing. "Repetition is favoured over novelty" p. 1001. Perhaps it is the individual's natural desire for security when facing a problem or challenge that causes a tendency to look to what is familiar, to jump to conclusions, or to make assumptions and, in turn, inhibits the ability to frame the problem succinctly.

Interpretation in turn may not be explained or controlled. How one interprets an event or a problem is the result of a myriad of infinite factors and can change from one day to the next. A friend described how, though he was able to solve a coin problem in his colleague's office, when asked to do so in front of a classroom of students, he was not able to solve it, despite his earlier success that very day. As well, though he faints at the sight of a needle one day, another day or at the sight of another needle, he manages to remain conscious. However, in understanding how interpretation acts upon problem representation, it may be possible to facilitate a positive interpretation of the problem and thus a representation of the problem free from constraints using an intervention that generates a cognitive shift in interpretation.

## *Failure*

The mechanism whereby one might shift an interpretation of a problem and thus increase divergence may exist within the problem itself. Ormerod et al (2002) point to an unusual approach: that of failure. With failure, individuals are driven to restructure the initial representation of the problem and open up their attentional focus. What are we ultimately anxious about when attempting to solve a problem? Failure. In an anxious state, we thus seek out what is familiar, our attention is narrowed, we spend our time dodging failure as opposed to taking risks and ‘testing unusual moves’ (Ormerod et al, 2002), thus making us less open to available cues. “The music of the violin we get by friction” (Ashcraft, 2002). When we meet failure at once, there is no need for constraints or protection. The result is an impulse to seek alternative moves, to broaden and relax our attentional focus, inadvertently increasing our capacity to solve the problem at the same time.

MacGregor et al (2001) and Knoblich, Ohlsson, Haider & Rhenius (1999) suggest that experiencing ‘criterion failure’ may induce an impulse to ‘seek alternatives’ while creating ‘a state of preparedness that disposes the solver to attend to solution-relevant information’. It seems a state of mental readiness is necessary for capitalizing upon novel, solution-relevant information. While it is suggested that ‘repeated failure’ can serve to relax constraints, unless the underlying mechanism causing constraints to be imposed is changed, the solver may simply impose new constraints (i.e. we must find something like a jack to fix a flat tire). It is not clear in either of these studies how or whether criterion failure serves to generate a ‘state of preparedness that disposes the solver to attend to solution-relevant information’. Intriguing is the concept of solution within failure.

Perhaps within failure, the problem presents itself again and demands a fresh approach or at least forces the solver to reevaluate what the problem is. In the case of the flat tire, having no recollection of a service station would mean criterion failure, offering a prime opportunity to not only reframe but to reevaluate the problem. The group might simply look for other ways to find a jack, or they might think ‘why do we need a jack anyway? What else could we use?’ What would encourage the group to look for the root of the problem?

While divergent training programs like Synectics ask for a suspension of judgment, openness and divergence of thinking (Harriman & Mauzy, 2003; Hicks, 1991; Nolan, 1989), the synectic approach is an imposed open mindedness as opposed to an emergent openness. Not everyone responds to being told to think openly. However, most people have the capacity to think openly and thus could be facilitated to open up their thinking processes. In line with all great pedagogical theory, a learner must follow their own path, and make their own connections in order to truly understand.

Inquiring deeply into the problem may help the solver to see the causal connections between the problem they experience and the actual source or ‘root’ of the problem. It may be possible to expose the fundamental problem behind the assumed representation of the problem. In clarifying the problem as such, one also clarifies what is most important to solving the problem. It is this cognitive shift from constraint to need that restructures the perception of the problem which has, in turn, been shown to increase capacity to process problem information and activate prior knowledge (Eubancks, Collins, & Smith, 2000; Eysenck & Calvo, 1992; Mogg, Mathews, Bird, & Macgregor-Morris, 1990). While putting De Bono’s six hats on may shake loose one’s paradigm or

perspective, it would seem to be most effective if we could shift one's thinking more specifically. The key to removing constraints upon problem representation may lie within the constraints themselves.

Criterion failure may not only signal the 'need to abandon the current operator and to search for an alternative operator', but may also signal a deeper problem. It may be, at the point of criterion failure, that an individual is not only open to alternative solutions, but also to alternative problem representations. It is at this point that it may be most possible to facilitate a shift in interpretation. As well, it may be this point that offers the pivotal point upon which an individual can make that shift. Is your solution working? No. Why not? Simply asking people to reconstruct the problem without facilitating an actual shift in cognitive bias may result in a construction still grounded in external locus of control: 'where can we get a jack?' 'how can we make a jack?' Shifting interpretation of the problem can occur by exploring actual constraints and not only serves to restructure the problem, but does so in such a way as to shift the interpretation of the problem so that it is free of constraints: 'why is the lack of jack a problem for you?' or 'what problems does the lack of a jack create?', the answer being 'because we need to lift the car in order to change the tire'. The cognitive shift is made to the goal and as such moves to a personal point of power: 'we need to lift the car'. If there had been no way of getting a jack, the group would have met with criterion failure and would have been forced to think of 'no jack' as a new problem, thereby reconstructing the problem in the appropriate way. Once the group constructs the problem appropriately, they are mentally prepared to 'see' the barn and all of the 'lifting' possibilities held within it.

While restructuring a problem representation does not necessarily lead to better solutions, the restructuring process seems central to effective problem solving. Several researchers in creative and insight problem solving suggest that the formation of a new representation of the problem is the only manner by which activation can be redirected: Getzels (1982) coined ‘problem construction’, Mumford et al (1994) was responsible for introducing ‘problem representations’, and Ohlsson, (1984;1992) explored ‘restructuring’. Kershaw and Ohlsson (2004) distinguish three classes of difficulty factors in solving insight problems: perception of the problem, processing of the problem information, and prior knowledge. Kershaw and Ohlsson (2004) and Ormerod, et al, (2002) demonstrate that the elimination of one factor does not allow an individual to solve a problem with multiple sources of difficulty. If a problem solver develops a correct representation of a problem, the relevant operators will be activated.

### *Insight*

Wertheimer (1959) articulated well the challenge we face in attempting to train creative problem solving: *insight* results from the sudden realization of a new, more penetrating view of a problem situation. Many cognitive psychologists agree that insight plays a necessary role in the development of creative solutions (Dominowski, 1995; Ohlsson, 1992; Knoblich, Ohlsson, Haider, & Rhenius, 1999; Schooler & Melcher, 1995; Sternberg & Davidson, 1995; Sternberg & Lubart, 1996). The concept of insight seems to capture the total mechanism we seek in aiming to determine how a person creatively solves a problem: Creative problem solving requires a certain shift in thinking or letting go of assumptions about the problem and its potential solutions characterized as insight or the ‘aha’ moment. While many have suggested ways to achieve a new view of the

problem (Clement, 1982, 1991; Newell and Simon, 1972; Schoenfeld, 1982; Schoenfeld and Hermann, 1982) it is not clear how to facilitate a more ‘penetrating’ view of the problem, a view of the problem that then prepares the mind to notice the insightful breakthrough, ‘aha’ or ‘outside of the box’ solution.

The insight mechanism is of particular interest due to implications for related areas of creativity, learning, and performance. For instance, the openness, looseness, or breadth of attentional focus typical of the effective insight solver would be quite useful in the athletic arena, enabling the player to utilize all relevant cues and see new possibilities for playmaking. Wayne Gretzky was known for his uncanny ability to ‘see 3 plays ahead of the play at hand’ and ‘hold the whole game in his mind’. Or, as Sidney Crosby, 16 year old hockey phenomena describes, insight is the ability to see “not where everyone is when you look, (but) where everyone will be if you buy some time and hold the puck for another second" (Allen, 2004).

While many theories abound, it is still unclear how insight really works. What is the underlying mechanism that causes insight to occur? What neurological, physiological, cognitive, or emotional processes are involved in promoting the insight experience? And, based on this knowledge, how might one facilitate or enhance insight? Insight problem solving has been characterized in various ways: For Schooler, Ohlsson, and Brooks (1993), insight involves

- a) a solution well within the competence of the average subject;
- b) a high probability of an ‘impasse’, that is, a state in which the subject does not know what to do next; and

c) an ‘Aha!’ experience resulting from sustained effort in which the impasse is suddenly broken and insight into the solution is rapidly attained.

Maier’s classic Two String Problem (1931) in which two strings are hanging from the ceiling, the distance between them making it impossible to reach one string while holding the other, the task being to tie the two strings together, is a classic illustration of insight impasse. The problem may initially be presented as a problem of distance or length of reach. Once this impasse is overcome however, the problem’s representation may open up to that of how to make the string longer or how to bring the strings together. The elegant solution is to take advantage of the string’s pendulum like qualities to bring the two strings together.

Ormerod et al (2002) argue that past experience may not account for initial problem representation as Kershaw & Ohlsson (2004) suggest but rather the problem display influences the solver’s initial interpretation and approach. However, upon closer reading, Ohlsson refers to ‘past *problem solving* experience’ which may indeed account for how the individual represents and therefore approaches the problem. Research on training insight problem solving supports this assertion (Ansburg & Dominowski, 2000). In my classroom, simply warning kids that this kind of problem will require you to think outside of the box prompts insightful solutions and serves to avoid potential impasses.

Bowden and Jung-Beeman (2003) explain the consensus view that insight problems ‘misdirect’ solvers to consider unhelpful information or solution paths. Macgregor et al (2001) point to the need for a certain level of ‘preparedness’ or openness to attend to solution-relevant information. For instance, many participants in their nine-dot studies attempted moves that captured the conceptual insight necessary to solve the

problem, yet did not appear 'ready' to see the solution and therefore returned to their initial limited thinking. What makes people ready to see that an impasse has been broken? Perhaps not only are people prevented from seeing solutions when they lack attentional breadth, but they are also prevented from seeing that an impasse has actually been broken. Likewise, some people see failure as an opportunity to learn and others are crippled by it. Again, if we draw a comparison to the sports field, even when there is an opening, it is often difficult for an individual to see it if they are not prepared to see it.

### *Readiness*

A certain amount of cognitive readiness may also be necessary to 'choose wisely' from alternative solutions once they arise. This suggests that the problem must be represented in such a way that the solver is not only generating viable solutions but also 'ready' to see the sustainable solution as it emerges (Seifert et al, 1995). Ohlsson (1992) re-conceptualized insight as "situations which are characterized by initial failure followed by eventual success". Ohlsson qualifies the term impasse as 'unmerited impasse' in that the solver is competent to solve the problem, and extends the definition to one of 'full insight' which consists of the breaking of the impasse plus the completion of the entire solution in the mind's eye pointing out that sometimes solvers continue to struggle even after breaking the impasse or cognitive constraint. In this case the impasse is broken accidentally or without the awareness of the solver. Such a concept points to Ormerod et al's (2002) suggestion that a certain level of preparedness is also necessary for full insight to occur: the solver must be ready to see that an impasse has in fact been broken and that a whole new realm of solution possibilities are available.

Ormerod et al (2002) show how, ‘even when a move capture(d) the conceptual insight necessary to solve the problem’, the solver would often return to the original constrained thinking (p. 798). Pasteur once said “Dans les champs d l’observation, le hazard ne favourise que les esprits prepares” (“In the field of observation, chance favours only the prepared mind”). The American physicist Joseph Henry echoed this axiom with “the seeds of great discoveries are constantly floating around us, but they only take root in minds well- prepared to receive them.” How many others alongside Newton had also witnessed an apple fall from a tree? This leads us to conclude that the cognitive shift, ‘shaking loose’ or ‘choosing wisely’ process need not occur at the solution end, but rather at the problem end. Perhaps the problem finding process may be more accurately described as a route finding process as well as a root finding process, in that we must navigate a pathway to a more precise representation of the problem. Finally, navigating one’s way past imposed constraints and being ‘ready’ to see solutions may demand a certain ‘letting go’ of assumptions about the problem. Ormerod et al (2002) suggest that meeting with failure can inspire the solver to look for alternative solution paths, or ‘let go’, as opposed to fixating on a pathway that is ineffective.

### Problem Solving Training Programs

The problem solving process demands creativity and insight in constructing the problem and generating possible solutions. Many researchers believe that various phases of the problem solving process can be augmented through awareness and practice of the behaviours that awaken and strengthen the creative potential residing within every individual to some degree (Basadur, 1986; Davis, 1973; Davis, 1983; Kane & Arnold, 1986). A number of approaches have been taken to training creativity and insight. Frame

breaking or cognitive restructuring (Khatena, 1973) is aimed at making individuals more 'self aware' (Suwa, 2003) of the way perception underlies the current interpretation and at helping them to break away from the commonplace to think more divergently or generate a greater variety of solutions. Researchers have shown that creatives possess a greater attentional and associative 'breadth' (Ansburg, 2000; Mednick, 1962; Mendelsohn & Lindholm 1972). De Bono's (1971) six hats approach, Morton and Weinstein's (2003), and Nalebuff and Ayres' (2003) simple and varied techniques for stimulating creative problem solving also present a variety of ways to 'shake it up' cognitively. Such programs have met with some success (Glover, 1980; Griffith, 1988; Jaben, 1983; Khatena, 1973; Speedie, Treffinger & Feldhusen, 1971). Most programs focus on raising the awareness or knowledge of the metacognition involved in creatively solving problems including knowledge of types of problems and problem solving strategies (Jausovec, 1994). In raising awareness of the assumptions or inappropriate constraints that people tend to apply to problems, one can open up the mind to solutions (Baughman & Mumford, 1995). Another path that has been taken to train creativity is that of problem construction or problem finding (Baer, 1988; Basadur, Hudgins & Edelman, 1988; Murdock, Isaksen, & Lauer, 1993; Riesenmy, Mitchell, Hudgins, & Ebel, 1991) which focus on developing the key cognitive processes underlying creative problem solving including problem identification and concept selection.

### *Divergent Thinking*

Parnes (1975) designed the Creative Problem Solving Institute (CPSI) of the Creative Education Foundation. Based on Osborn's approach, the Institute has incorporated a number of other theories and programs over the past 20 yrs. Fundamental

to the Institute's teachings is a 5-step process: fact-finding, problem-finding, idea-finding, solution-finding, and acceptance regarding one's goals. Synectics, creative analysis, human potential development, creative experiences, and body awareness are approaches that are used. The core of the program is to stretch the imagination at all stages of problem solving, and to develop a balance between judgment and imagination. Likewise, the Army Corps of Engineers utilize a modified version of the Parnes & Osborn model including: Identifying problems and opportunities, Inventorying and forecasting conditions, Formulating alternative plans, Evaluating alternative plans, Comparing alternative plans, Selecting a plan. Rose & Lin (1984) conducted a meta-analysis of 46 creativity training program studies and evaluated these for fluency, flexibility, originality, and elaboration. Of these studies, the Osborn Parnes Creative Problem Solving Program sustained a substantial impact on verbal creativity and seemed to support the conclusions of Torrance (1972) and Parnes and Brunelle (1967) in support of the effectiveness of this program.

Scott, Leritz, & Mumford (2004) performed a meta-analysis of creativity training programs and, based on 70 studies, found that successful training programs were likely to focus on both idea generation and cognitive skills training. Each type of training program is described in terms of course length, sample size, age and nature, difficulty, delivery, and criteria. Idea Production Training programs include conceptual combination, divergent thinking, ideation, elaboration analogies, brainstorming, and problem identification (Castillo, 1998; Glover, 1980; Griffith, 1988; Jaben, 1983; Jausovec, 1994; Khatena, 1971; Speedie, Treffinger, & Feldhusen, 1971). For example, generating metaphors that capture the problem or situation can challenge assumptions and lead to

new insights and ideas. De Bono's Six Hats Thinking calls for all thinkers involved to be thinking in the same 'direction.' The direction is indicated by one or other of the six coloured hats. For example, the White Hat requires an attention to information: what do we have; what do we need; what is missing. The Green Hat demands a focus on 'creative effort.' When the Green Hat is in use everyone makes a creative effort: new ideas, alternatives, modifications of an idea, possibilities, or provocations. Divergent thinking strategies that 'break loose' from standard ways of thinking are believed to cultivate and increase creativity and thus enhance problem solving ability.

### *Metacognition*

Raising an individual's awareness of the cognitive skills and processes involved in problem solving has been shown to enhance problem solving skill (Anderson, 1987; Perkins & Salomon, 1989; and Sternberg & Frensch, 1993). Masaki Suwa (2003) suggested that a meta-cognitive approach in which 'individuals are trained to become more self aware of the operation of one's own perception and conception' in order to facilitate the 'reorganization of perception and construction of a new interpretation' (p. 232) resulted in improved problem solving and creativity skills. Cognitive skills training can include critical thinking elements such as problem finding, idea generation and evaluation, meta-cognition, elaborations, selection monitoring (Hudgins & Edelman, 1986; Ohlsson, 1992; Hudgins, Riesnmy & Ebel, 1989), and creative processing skills such as problem identification, information gathering, concept selection, idea generation and evaluation, implementation, planning, monitoring, divergent and convergent thinking (Baer, 1988; Murdock, Isaksen, & Lauer, 1993). Dominowski and Ansborg (2000), in attempting to promote insight problem solving skills, used a meta-cognitive approach,

providing solvers with advance strategic instructions that a) are procedurally relevant, b) point to the procedural similarities among problems, and c) emphasize the usefulness of the procedures across the problems (p. 34). Cropley (2000) also used a meta-cognitive approach in training creative problem solving by providing ‘counselling’ to engineering students challenged to ‘build a wheeled vehicle powered by the energy stored in a mouse trap’. Cropley (2000) offered lectures on cognitive processes involved in creative problem solving as well as individual ‘counselling sessions’ in which students were encouraged to tolerate unusual or unexpected ideas, to defer judgment, and to think divergently, with significant effect on creative performance.

### *Cognitive Restructuring*

For some, the key to creative thought may be the combination and reorganization of information and concepts to advance new understanding of new conceptual systems. Hertel, Mathews, Peterson, & Kintener (2003) demonstrated that it is possible to train interpretations of ambiguous homographs and conclude that it is then possible to facilitate a shift in interpretive bias. Rothenberg (1996, 2005) in his studies of Nobel laureates, found that these new combinations often provided the basis for scientific and technological advances. Owens (1968) and Mumford et al (1997) found that conceptual combination was one of the best predictors of creative achievement in advertising and mechanical engineering (managing creativity). To measure the skill of conceptual combination, Mednick (1969) developed the RAT (Remote Associations Test).

Conceptual combination training can take many forms, but generally involves using analogical reasoning mechanisms to extract abstract elements of concepts in order to make new linkages between concepts. Such remote associations can aid in the ‘frame

breaking' aspect of creativity, relaxing the default constraints that culture, experience, prior knowledge and expectations place upon an individual's representation of various concepts such as 'knife' (for cutting). For instance, by default, birds and planes may be seen as related because both fly. However, planes have the added feature of 'container', or the metaphorical feature of 'escape'. Identifying this added feature to a plane may allow an individual to align plane with another concept not typically in juxtaposition with it. It is argued that such conceptual combination or remote association is the hallmark of creative thought because new combinations may provide the basis for improved understanding and for new ideas.

For example, Ohlsson describes three mechanisms for restructuring a problem: re-encoding, elaboration, and constraint relaxation. Re-encoding involves letting go of an initial representation of problem elements. The hotel could be a toy hotel and thus the man becomes bankrupt because he is playing monopoly. Elaboration changes the problem representation through the addition of information, something the solver may have overlooked. The two hikers might be hiking toward each other rather than assuming that they are moving away from each other, thus explaining the fact that they meet very soon after departing in opposite directions. Who says they started from the same point? Constraint relaxation rectifies impasses caused by inappropriate representations of the goal state. A car can be raised in a variety of ways beyond that of using a jack. Once the constraint of 'needing a jack' is relaxed, several other alternatives present themselves: 'what else can we use besides a jack to raise the car?'

Ansburg and Dominowski (2000) designed a program to promote insight problem solving ability by developing the skills of re-encoding, elaboration and constraint

relaxation. Their program consisted of advanced strategic instructions, practice with feedback on procedurally similar problems, and problem comparison, finding that facilitations effects ranged from 14-24% gain in overall solution rates. Mumford and Baughman (1997) suggest using feature mapping or metaphor search strategies to improve concept combination and have shown that such strategies can be utilized to improve creativity. Such training techniques date back to historical studies (Tweney, 1992) and experimental studies (Maier & Burke, 1970; Rothenberg, 1973, 1986). Other techniques include Forced Relationships, Free Association, Attribute Listing, Synectics, and Lateral Thinking, all involving to some degree, strategies for exploring alternative views of concepts and their relationships in order to support new combinations, understanding, and ideas.

The Organizational literature (Andriopoulos, 2001 for a review) points to several factors that could enhance creativity in employees including culture, climate, leadership, resources, structure and systems, many geared to promoting 'autonomy, ownership, and control over their own work and ideas' and ensuring 'participative safety'. Employees can only be encouraged to think creatively if they are not afraid of criticism and punishment. Several techniques for effective problem solving and decision making have emerged in the organizational literature, all designed to guide the problem solving process by both 'breaking the old frame' and 'restructuring a new frame'. Tools include: Brainstorming - Generating Options, Critical Path Analysis - Planning and Scheduling Complex Tasks, Decision Trees - Powerful Quantitative Analysis of Decision Impact , Force Field Analysis - Analysis of all Pressures For and Against Change, SWOT Analysis - Analysing your Strengths, Weaknesses, Opportunities and Threats. Tools that

demand individuals explore a variety of aspects of the problem increase the possibility for solutions by both relaxing constraints, enhancing conceptual combinations and clarifying the problem at its root.

### *Problem Finding*

Divergent thinking has been shown to correlate with creative problem solving ability (Feldhusen & Clinkenbeard, 1986; Harrington, Block & Block, 1983). But the challenge for creative problem solving trainers lies not only with facilitating divergent thinking but also then with ‘choosing wisely’ from the wildly divergent ideas. Lateral thinking alone will not necessarily arrive at a good solution. Likewise, analyzing the problem too convergently may limit the quality of solution. A combination of divergence and convergence seems ultimately desirable. The success of solution choice seems then to rely on how the problem is defined.

A certain amount of divergence is required but mostly with regard to how the problem is represented. Jay and Perkin’s (1997) review of the problem-finding literature indicated that interventions focusing on a particular skill such as problem finding within a particular domain such as science can yield tangible improvement in creative performance. What will allow a person to see the problem for what it is at its foundation (the need to raise the car) as opposed to symptomatically (the need for a jack). Perhaps it is the individual’s natural desire for security when facing a problem or challenge that causes a tendency to look to what is familiar, to jump to conclusions, or to make assumptions and, in turn, inhibits the ability to frame the problem succinctly. In that case, all that is required is a certain amount of ‘shaking loose’ or exercise in ‘thinking outside of the box’ to enable people to relax constraints placed on the problem construction.

The concept of problem finding comprises another effort at training creativity. Suwa (2003) explored the possibility of training conceptual reorganization and concluded that ‘a coordination of both perceptual reorganization and conceptual generation in a productive cycle constitutes acts of problem finding in a creative experience’ (p. 232). The coordination of the two cognitive actions was found to demand the skill of constructive perception (a meta-cognitive skill to coordinate the operation of one’s own perception and conception), a skill thought to demand elaborate training. However, others have designed more straightforward frameworks for approaching a problem in ‘problem finding’ ways thought to be more conducive to solution finding. While strategies such as the IDEAL framework (Bransford, Hayes, Stein & Lin, 1998) stress the ‘identification’ of problems in general, suggesting that an attitude of differentiation or sensitivity to the problematic be encouraged, it remains unclear as to how such an attitude is ‘trained’. Others suggest that skill in problem construction (definition and redefinition of the problem) will promote creativity by providing a more flexible approach to problem solving. The ability to reframe problems in a variety of ways suggests that the problem solver possesses not only an ability to explore a problem thoroughly but also a readiness to change approach or even redefine the problem (Runco, 1994). Training ‘problem reconstruction’ may be a more complex matter than simply practicing the act of reformulating problems as Reiter-Palmon et al (1997) discovered. Using active processing (Baer, 1988), inducing participants to restate the problem before solving it, Reiter-Palmon et al found no effect despite support for the intervention by Redmond et al (1993). Perhaps delving more deeply into the problem construction process will provide a more significant leverage point with which to enhance creative problem solving.

## Theories of Attentional Focus

Theories of attentional focus and related concepts such as cognitive and stress appraisal offer insights into how humans construct and then solve the challenges and problems they face. Competing theories have been proposed to account for decrements in skilled performance under pressure. Many of the attentional focus theories demonstrate that an 'external' or goal focus is facilitative to performance. A goal is defined as something that an individual is trying to accomplish; it is the object or aim of an action (Locke & Latham, 1990). Goals are also believed to move in and out of conscious awareness at different times, operate largely through the internal comparison processes, and require internal standards against which to evaluate ongoing performance (Weinberg, 1994).

### *Distraction Theories*

Distraction theories propose that pressure creates a distracting environment that shifts attentional focus to task-irrelevant cues, such as worries about the situation and its consequences (Eysenck, 1992; Wine, 1971). This shift of focus changes what was single-task performance into a dual-task situation in which controlling execution of the task at hand and worrying about the situation compete for attention.

### *Self-focus Theories*

Perhaps more appropriately termed explicit monitoring or execution focus theories, as they are concerned with attention to skill execution, self-focus theories suggest that pressure raises self-consciousness and anxiety about performing correctly, which increases the attention paid to skill processes and their step-by-step control (Baumeister, 1984; Lewis & Linder, 1997). Attention to execution at this step-by-step

level is thought to disrupt well-learned or proceduralized performances (Kimble & Perlmutter, 1970; Langer & Imber, 1979; Lewis & Linder, 1997; Masters, 1992). Wulf, McNevin, and Shea, (2001) and Wulf, Shea, and Park (2001) have shown that by focusing on body movements themselves, performers intervene in the control processes of the body, resulting in decreased learning and performance. Focusing externally allows for the body's automatic system to control an individual's movements, whereas focusing internally causes interference in automatic processes of the body. This has been shown for a variety of tasks—including soccer and volleyball (Wulf & McNevin, 2003) and piano playing (Wan & Huon, 2005) and mathematical problem solving (Beilock & Carr, 2001), mental health (Bond and Bunce, 2000, 2003; Hayes, et al, 2001), team perspective (Driskell, Salas, Johnston, 1999), and creativity (Higgins, Shah, Friedman, 1997; Friedman & Forster, 2001).

### *Reinvestment Theory*

Reinvestment theory (Masters, Polman, Hammond, 1993) hypothesizes that individuals have a predisposition toward reinvestment of controlled processing (a tendency to introduce conscious control of a movement by isolating and focusing specific components of it). The Reinvestment Scale, an instrument to measure such a construct, was developed from the Cognitive Failures Questionnaire, the Rehearsal factor of the Emotional Control Questionnaire, and the Public and Private factors of the Self-Consciousness Scales and administered to 144 undergraduates. Results from 4 studies indicated that high reinvesters were likely to suffer from performance breakdown under pressure.

### *Self Consciousness Theory*

Self Consciousness theory (Baumeister, 1984) proposes that the personality trait of self-consciousness may moderate the relationship between pressure and performance.

Baumeister argued that competition induces arousal, which, in turn, results in attentional focus on oneself and disruption of well-learned skills. Furthermore, Baumeister suggested that “persons who are habitually self-conscious should find it easier to cope with situations that engender self-consciousness because they are accustomed to performing while self-conscious” (p. 611). Thus, less (as opposed to more) self-conscious persons should be more likely to choke because they are unused to dealing with the self-focus brought about by (competition-induced) arousal. Although data from several laboratory experiments (Baumeister) were consistent with that position, support within a genuine sporting context was missing.

However, in a study by Dandy et al. (2001) the relationships between self-consciousness and decrements in performance were not consistent with those predicted by Baumeister (1984; Baumeister & Showers, 1986) or with the concept of ‘reinvestment’ (Masters, Polman, & Hammond, 1993) but to some degree with both. Rather, decreased performance seemed to be caused by a variety of attentional distractions and to depend upon the individual.

### *Cue utilization or ‘Hypervigilance’ Theory*

Cue utilization or ‘hypervigilance’ theory proposes that anxiety leads to more focused or ‘narrowed’ attention. Easterbrook's (1959) hypothesis proposes that emotional arousal is related to a restriction in attentional range. In contrast, Eysenck's (1992) hypervigilance theory predicts that anxiety is related to an increase in the range of stimuli that will be

attended to, at least until an actual threat has been detected. However, emotional state might interact with certain situational factors to produce either of these effects. The classic arousal perspective argues that stress results in heightened arousal and that arousal leads to a narrowing of attention (see Broadbent, 1971; Easterbrook, 1959). As attention narrows, peripheral (or less relevant) task cues are first ignored, followed by further restriction of central or task-relevant cues. To the extent that task-relevant cues are neglected, performance suffers. Accordingly, tasks that demand attention to a wide range of cues are more susceptible to degradation under stress.

### *Regulatory Focus*

The concept of ‘regulatory focus’, approach and avoidance motivation (Friedman & Forster, 2000), or promotion and prevention focus (Higgins, Shah and Friedman, 1997) addresses the power of focus direction. Higgins posits two motivational orientations that govern cognitive mechanisms: promotions focus (motivation to attain nurturance) and prevention focus (motivation to avoid harm). Studies in this area have focused mostly on creativity and creative problem solving. A promotion focus implies a cognitive style that is more exploratory and ‘risk-taking’ whereas a prevention focus adopts a cognitive style of processing that is more vigilant, defensive and ‘risk-averse.’ Promotion focus is seen to enhance performance while prevention focus is seen to impair performance and creativity.

### *The Theory of Cognitive Bias*

The theory of ‘cognitive bias’ (Eysenck, 1997) suggests that one of the major functions of anxiety (the result of a cognitive ‘threat’ appraisal) is to create a bias in cognition. It is a well-established fact that emotions bias the cognitive processing of

stimuli: There is preferential processing of emotional stimuli that are congruent with one's current mood or stable personality traits (see review in Rusting, 1998). Anxiety has probably been the main focus of interest in this regard (Eysenck, 1997; MacLeod, 1999). In a functional account of emotions (Keltner & Gross, 1999), anxiety is part of a defensive mechanism against potential dangers. Anxiety fulfills this protective function both at the cognitive level, by means of facilitating anticipatory threat detection, and also at the behavioral level, by means of mobilizing resources before the actual harm occurs. Accordingly, if threat is to be identified early, in order to further preparatory defensive responses, anxiety should bias the cognitive system toward prioritizing the processing of threat-related cues: (1) attention should be selective, favoring the coding of threat-related stimuli over neutral stimuli; (2) ambiguous stimuli should be interpreted preferentially as threatening; and (3) threat-related information from prior experience should be especially retrievable from memory. There is now considerable experimental evidence for an attentional bias including increased attention to threat cues (Bradley, Mogg, Falla, & Hamilton, 1998; Byrne & Eysenck, 1995; Fox, 1996; MacLeod & Mathews, 1988; Mogg, Bradley, & Hallowell, 1994).

Many of the studies on the topic of cognitive bias involved high anxious or 'trait-anxious' individuals showing a greater propensity for bias. However, following acute stress, it was later shown that all individuals appear to selectively allocate processing resources to threat stimuli (Mogg, Mathews, Bird, Macgregor-Morris, 1990). A biased response to acute stress does not seem to be modified by individual differences in susceptibility to anxiety. This bias is thought to result from the stressful event directly priming cognitive representations of threat. Thus, both high and low trait anxious

individuals appear to react to an acute stressful event in the same way—by becoming vigilant for further sources of threat in the environment. Keogh and French (2001) found further support for Mogg et al.'s study in an experiment with test-anxious individuals.

### *Inhibition Theory*

Connelly, Hasher, and Zacks' (1991) 'inhibition theory' proposes that a deficient inhibition mechanism causes working memory resources to be consumed by task-irrelevant distracters. Thus performance depends upon ability to inhibit attention to distracting information. In many ways the concept of attentional inhibition is just a negative way to describe external focus. One is unable to inhibit distraction in much the same way one's attention is drawn to threat. It is possible to conceive of attentional control in terms of either 'blocking out distraction' or of 'retaining a task focus.' However, it can be argued that energy spent 'blocking out distraction' would also detract from performance. The theory would also imply that trait anxious individuals would suffer from a general state of distractibility whether the distracters are threatening or not. Evidence argues against such a general degree of distractibility in anxiety. Keogh and French (2001) provided no evidence either of a general deficit in the ability to focus attention in anxiety or of increased susceptibility to distraction by neutral stimuli. The idea that one is simply not drawn to attend to a distraction because it is not perceived to be threatening is more likely because it implies sustained attention toward the task for high performers.

### *Neuro-Physiological Approaches*

Recently, neuro-physiological approaches to the study of attentional focus have emerged. While most studies examining attentional focus effects have exclusively used

performance outcome measures (e.g., accuracy), some studies used ‘electromyography’ (EMG) to determine neuromuscular correlates of external versus internal focus differences in movement outcome. Zachry, Wulf, and Mercer (2005) recorded EMG activity on basketball players under both internal focus (wrist motion) and external focus (basket) conditions finding that an external focus of attention enhances movement economy, and presumably reduces “noise” in the motor system that hampers fine movement control and makes the outcome of the movement less reliable.

Fichtenholtz, Dean, Dillon, Yamasaki, McCarthy and LaBar (2004) used event-related functional magnetic resonance imaging (fMRI) to investigate how attentional focus can modulate the neural activity elicited by scenes that vary in emotional content. Emotional and attentional functions are known to be distributed along ventral and dorsal networks in the brain, respectively. However, the interactions between these systems remain to be specified. Using a visual oddball task a main effect of emotion was found in the amygdala (AMG) and ventral frontotemporal cortices. A main effect of attentional focus was found in dorsal frontoparietal cortices, whose activity signaled task-relevant target events irrespective of emotional content. The only brain region that was sensitive to both emotion and attentional focus was the anterior cingulate gyrus (ACG). The ACG response to emotional scenes increased when they were task-relevant, and the response to circles concomitantly decreased. These findings support and extend prominent network theories of emotion-attention interactions that highlight the integrative role played by the anterior cingulate.

Vance et al. (2004) used electromyography (EMG) to determine whether differences between external and internal foci would also be manifested at the

neuromuscular level. In two experiments, participants performed biceps curls while focusing on the movements of the curl bar (external focus) or on their arms (internal focus). Under an external focus, the task was performed faster and integrated EMG (iEMG) activity was reduced. Results were in line with the constrained action hypothesis in which an external focus promotes the use of more automatic control processes (Wulf, McNevin, & Shea, 2001).

#### *Motivational Climate and Achievement Goal Theory*

In the area of motivational climate and achievement goal theory, it has been shown that motivational climate has a central place in the regulation of subsequent affective states, cognitions and behaviour in achievement contexts. Motivational climate, the context in which an individual is performing, can induce a certain achievement motivation or performance focus based on the achievement criteria it supports. Based on goal achievement theory, performance criteria may be more task focused, emphasizing self-referenced mastery and personal growth, or more ego focused, emphasizing other-referenced social comparison as a measure of success. Therefore motivational climate can be seen to impact attentional focus as well. Ommundsen and Roberts (1999) examined the relationship between different profiles of the motivational climate in teamsport and achievement, and socially related cognitions among Norwegian team sport athletes. Athletes perceiving the climate as high in mastery and high in performance oriented criteria reported psychological responses that were more adaptative than those perceiving the climate as low in mastery and high in performance criteria. Importantly, the high mastery climate seemed to moderate the impact of being in a high performance climate. The pattern of findings suggests that perceiving the motivational climate as performance

oriented may not be motivationally maladaptive when accompanied by mastery oriented situational cues. In other words, having a goal focus may serve to resolve the pressures of a performance situation. Brunel (1999) demonstrated that motivational climate or expectations at the contextual level may override individual goal orientations. However, he asserts that climate should only have temporary effect at the contextual level if it is not regularly emphasized at the situational level.

The above theories share a number of common principles including a conceptual basis grounded in appraisal and neurophysiology and the assumption that attention 'shifts' from one focus to another (i.e. from threat to goal). However, no theories have accounted for considerations of individuality or situation. Individuals may find an infinite number of things potentially threatening based on both individual nature and situation. Attempting to find cause for threat appraisal (i.e. internal, self, distraction, step-by-step process, external expectation, etc.) may be an indefinite pursuit.

#### Attentional Focus Training Programs

##### *Imagery and Relaxation*

Attentional training techniques have included techniques in imagery (Garza & Feltz, 1998), relaxation (Suinn, 1985), and development of pre-performance routines (Boutcher, 1990; Moran, 1996). However, research results are inconsistent or criticized as methodologically weak (Perry & Morris, 1995; Weinberg, Seabourne, & Jackson, 1987). In an important study on 126 golfers, the practice of simply attempting to replace negative images with corrective ones proved ineffective in preventing a performance decline due to the attention required to suppress negative images (Beilock, Afremow, Rabe, & Carr, 2001). Blocking out, replacing, or averting attention from perceived threats

to performance goals appears ineffective. Perceived threats may require some form of amelioration or resolution before attention can move from threat to goal.

### *Biofeedback*

The most promising technique appears to be biofeedback (Landers et al., 1991) though it too is unsubstantiated by empirical research. While biofeedback interventions consider psycho-physiological correlates of attention, arousal, and performance, interventions are complicated and have limited empirical support. It has been suggested that biofeedback may be most effective as a complex, multi-stage approach in which different processes are relevant at different stages of performance, an approach that may be too difficult to replicate realistically (Qualls & Sheehan, 1981). Findings suggest that an external attentional focus strategy is associated with more ideal alpha frequencies and heart rate during the performance of a self-paced motor task. It has been demonstrated that psycho-physiologically, the magnitude of EEG alpha power was significantly higher (lower mental activity suggesting more efficiently activated task-relevant brain areas) for an external focus group as opposed to an internal focus group. In the area of problem solving, Jausovec (1997) showed that twenty five students displayed lower alpha power (higher mental activity and chaos) when reading and approaching ill-defined problems and higher alpha power when reading and approaching more clearly defined problems. As well, regarding heart rate, participants using the external attentional focus strategy experienced a deceleration in heart rate immediately prior to dart release, while a group using the internal focus strategy showed an increase in heart rate (Radlo, Steinberg, Singer, Barba, Melnikov, 2002). However, attempting to create optimal attentional focus states using biofeedback (heartrate training) has been unsuccessful for the most part. For

instance, in a study on golf putting, although subjects in biofeedback conditions learned to control their HR during training, the transfer of this skill was inhibited (Damarjian, 1993).

### *Acceptance of Negative Experience/Emotion*

In their study of mental health and work performance, Bond and Bunce (2003) found that “people who do not try to avoid or control psychological events have more attentional resources, engage in less avoidant behaviour, and may learn how to they can most effectively use the control that they have to promote their mental health” (p. 1064). Attentional resources directed toward avoidance, resignation, control, or denial of feelings are no longer available to address the barrier, nor decide upon and complete the correct course of action for a successful outcome (Bond and Hayes, 2002; Hayes et al, 1999). Perception and focus may also play a large role in generating and resolving barriers to return to work after illness or injury, and consequently in predicting disability and return to work outcome as well as enduring outcomes for individuals struggling to overcome a workplace illness or injury.

Current psychological interventions assert that acceptance of the negative feelings or anxieties that accompany a stressor is facilitative to rehabilitative outcome (Hayes, 1987; Bond & Bunce, 2003; Bond & Hayes, 2002); however, not everyone interprets anxiety as debilitating, and therefore not everyone would benefit from accepting their negative emotions as a means to moving past them. Within a mental health study, negative feelings may in fact be the primary threat to treatment outcome. However, in order to generalize the concept of acceptance, it is important to identify acceptance as the common mechanism for attentional shift as opposed to the object of acceptance

(acceptance meaning ‘tolerance’, ‘acknowledgement’, and ‘recognition’ as opposed to ‘surrender’, ‘giving up’, or ‘acquiescence’).

### *Failure or Impasse*

In the area of problem solving, Ormerod, MacGregor, & Chronicle (2001, 2002), and Knoblich, Ohlsson, Haider & Rhenius (1999) suggest that when attempting to ‘relax constraints’ during the problem solving process the experience of ‘criterion failure’ may induce acceptance and generate an impulse to ‘seek alternatives’ while creating ‘a state of preparedness that disposes the problem solver to attend to solution-relevant information.’ It is not clear in either of these studies how or whether criterion failure serves to generate a ‘state of preparedness that disposes the solver to attend to solution-relevant information,’ though the concept of solution within failure is intriguing. Perhaps within failure, a certain degree of acceptance and ‘letting go’ of perceived threats occurs, enabling the solver to re-evaluate the performance challenge with the perceived threat becoming part of the performance goal reality. In the particular case of failure, the individual may ask ‘what must I do to achieve my goal given this new reality?’ In this way, threat is transformed into goal. Operating within a goal frame allows automatic processing or ‘smart motor systems’ to generate solutions for resolving the threat relative to the goal rather than generating solutions for resolving the threat at the expense of the goal.

## Common Factors in Theories and Training Programs

### *Appraisal*

Appraisal models of emotions (Frijda, 1986; Lazarus, 1991, 1999; Roseman, Spindel, & Jose, 1990) propose that emotions arise from the evaluation of an event's

impact on valued goals. Smith and Lazarus (1993) identified two categories of appraisal that influence emotion. Primary appraisal assesses the personal relevance of a situation (its motivational relevance) and the extent to which the situation is in keeping with personal goals (its motivational congruence). These identify the situation's valence: threatening situations, for example, are characterized by motivational relevance and motivational incongruence. Secondary appraisal evaluates coping options and outcomes, and includes accountability (who/what is responsible for the situation), future expectancy (likelihood of change), problem-focused coping potential (options for influencing the situation), and emotion-focused coping potential (ability to emotionally adapt to the situation). According to Lazarus (1991), secondary appraisal involves an evaluation of coping options and as a consequence the type of coping strategies an individual adopts. Appraisal may influence coping, and therefore focus, by directing attention towards certain environmental features or opportunities as well as internal characteristics (such as self-efficacy beliefs).

It is important to note that attentional focus implications (i.e. explicit vs implicit) are caused by the appraisal mechanism. Beilock et al. (2004), in attempting to establish the legitimacy of the explicit monitoring theory by illustrating the impact of high pressure or perceived threat on working memory, demonstrate that high pressure only impacts performance on high demand problems. However, they miss the point in that anxiety is not necessarily always perceived as threatening or as a barrier to performance to everyone (Jones, 1992; Jones & Swain, 1995; Jones, Swain, & Hardy, 1993) therefore it is questionable whether an attentional focusing effect would come into play in the scenarios they describe. Their results may have little to do with working memory and more to do

with cognitive appraisal. In any study on the impact of attentional focus, it is important to establish that the ‘pressure’ or ‘threat’ is perceived as a real barrier for the individual.

### *Neurophysiology and Stress*

In his extensive review of the literature, Baumeister et al. (2001), in ‘a disappointingly relentless pattern’ in over one hundred articles, found that when equal measures of good and bad are present, the psychological effects of bad ones outweigh those of the good. This may in fact be a general principle or law of psychological phenomena, possibly reflecting the innate predispositions of the psyche or at least reflecting the almost inevitable adaptation of each individual to the exigencies of daily life. This pattern has already been recognized in certain research domains. This is probably most true in the field of impression formation, in which the positive–negative asymmetry effect has been repeatedly confirmed (Anderson, 1965; Peeters & Czapinski, 1990; Skowronski & Carlston, 1989). In general, and apart from a few carefully crafted exceptions, negative information receives more processing and contributes more strongly to the final impression than positive information.

Ledoux (1989, 1998) has shown that cognition and emotion are mediated by separate but interacting systems within the brain. As de Sousa points out (1991, as cited in Taylor, p. 223) “no logic determines salience: what to notice, what to attend to, what to inquire about. And no inductive logic can make strictly rational choices.” Emotions also limit what the brain processes based on salience or value judgments. Feelings guide reason and vice versa. Physiological and neurobiological studies using brain imaging techniques (PET and MRI) confirm the interaction between cognitive and emotive processes by showing increased bloodflow to areas of the brain responsible for emotional

processing (i.e. the amygdala, hypothalamus and limbic system) during stress, failure, worry. The emotional part of the brain shows decreased bloodflow or 'deactivation' when the individual is engaged in a more cognitively demanding task (Drevets & Raichle, 1998).

Pratto and John (1991) set out to test whether attentional resources are automatically directed away from the current task when extraneous stimuli, either good or bad, are presented. Using a modified Stroop paradigm, the researchers presented participants with personality trait adjectives (i.e. sadistic, honest), and participants were instructed to name the color ink in which each word was printed. To the extent that attention was automatically seized by the meaning of the trait, participants would be slower to name the color. In the first study, people took longer to name the ink color when the word referred to a bad trait than when it was a good trait. Thus, the meanings of bad traits had greater power for attracting attention, as compared with good traits. Retrospective self-reports indicated that participants claimed they ignored the words and concentrated on the colors, which is consistent with the view that any interference occurred at an automatic and not a fully conscious level.

### *Individuality*

While attentional theories seem to agree on certain key processes, they are polarized in terms of cause. The common factors among them include stress or pressure and a distracting concern drawing focus away from, or too much within, the task at hand. Each theorist asserts a unique cause for the phenomenon of debilitating focus from distraction to explicit monitoring to threat vigilance. However, all of the theories may be correct for none of these theories accounts for individuality. Under pressure, individuals

find different things to be stressful and distracting. In fact, some individuals may interpret the pressure or stress to be facilitative rather than debilitating and not feel stressed or pressured in the least. If one considers anxiety a stressor unto itself accompanying a challenge situation, the result of a threat appraisal and a physiological readiness mechanism, one can see that anxiety might meet with a typical cognitive appraisal process. In fact, sports psychologists have found that people appraise anxiety in much the same way that they might appraise any stressor or challenge (Jones, 1992; Jones & Swain, 1995; Jones, Swain, & Hardy, 1993); that is, one would primarily appraise anxiety as a threat or a non-threat, and, if deemed threatening, secondarily appraise one's capacity to respond to the threat posed by the anxiety.

Attentional focus theories also tend to ignore considerations of state versus trait responses to challenge situations. An individual may find a time constraint to be threatening in one situation such as on a test, but not in another, such as in the pre-race area of a ski race. While trait characteristics may influence situational attentional focus, a situational measure or approach is more relevant and informative to performance enhancement efforts.

#### *Attentional Shift*

The insight within these theories is that under perceived debilitating pressure or stress, an individual's focus, and thus performance, is impaired because the individual perceives something to be threatening to their performance and must attend to it. It matters not what the perceived threat is specifically, whether it is the crowd, or their rising heart rate, but only that their focus (and associated cognitive resources) has shifted to address a threat. Again the myriad of individual strategies for dealing with the equally

infinite kinds of perceived threats could range anywhere from ‘trying harder to control execution of specific body movements’ to ‘trying to block out the noise of the crowd’ to ‘trying to lower one’s heart rate with deep breathing.’ Each of these strategies, whether they fall within the explicit monitoring theory, distraction theory, or cue utilization theory, are the result of a perceived threat and are an attempt to control or reduce the threat. All of these strategies shift focus toward a threat focus and away from task performance.

How to facilitate a goal focus despite perceived threats poses the greatest challenge to researchers and performers in any realm. In a review of attentional focus training methods, it is difficult to ascertain what mechanism might serve to shift an individual’s attentional focus from threat to goal.

#### Theories of Problem Solving and Injury

No matter what obstacles are at play in developing chronicity of injury, one area of research that seems to offer insight into the problem of workplace injury is that of perception, attentional focus and consequent representation of the challenges associated with the injury. Following a musculoskeletal injury, such as in the lower back, the development of chronic pain and disability has been attributed to the ‘deconditioning syndrome’ (Mayer, 1999). Deconditioning occurs as a result of fear-related inhibition and physical disuse. However, psychological variables such as fear avoidance are likely only a small piece of the rehabilitation puzzle. A number of physiological, psychological, and sociological variables interact to help or hinder an individual’s rehabilitation and treatment outcome making it difficult to isolate causal factors (Brooker et al, 2000; NIDMR, 2000, Schrey, 1996). Therefore, insight into the more common mediating factors of appraisal and focus determining an individual’s problem solving or coping

response may provide leverage in designing more effective individual rehabilitative programs.

### *Pain as Problem Solving*

The most prevalent and expensive work-related injuries are soft-tissue injuries, primarily those of the lower back and upper extremities (Armstrong, et al, 2000; Brooker, Clarke, Sinclair, Pennock & Hogg-Johnson, 1998; Silversides, 1998). Workplace injuries can result in substantial financial losses to employers through disability insurance premiums, workers' compensation premiums and worker replacement costs (Johanning, 2000; Krause & Ragland, 1994; Scheer, Racack, & O'Brien, 1995). Well documented factors ensuring successful disability management programs, or safe and early return to work, include employer participation, a supportive work climate, and cooperation between labour and management (Frank et al, 1996; Frank et al, 1998; van der Weide, Verbeek, & van Tulder, 1997). However, in a systematic review, van der Weide et al. (1997) found that for patients with low back pain, physical, behavioural, educational, and pharmaceutical interventions when administered during the acute or chronic phase had limited effect on return to work. There is a growing body of research to suggest that cognitive and affective variables play a significant role in determining the chronicity of low back pain or injury (Hazard, Fenwick, & Kalisch, 1989; Rainville, Ahern, & Pahlen, 1993). It is suggested that isolating the specific belief, affective factor, or attitude interfering with an individual's treatment outcome, may allow the intervention to address the specific belief. However, it seems an infinite number and kind of interventions would be necessary to address the myriad of individual beliefs. Rather than trying to change people's beliefs, the current research proposes to explore the problems that beliefs can

pose to the rehabilitative process. If an individual perceives an injury to be particularly threatening, this perception however real or imagined, exerts a very real effect upon the individual's cognitive processes, dominating attention, creating a barrier oriented focus and inhibiting the generation of creative and sustainable solutions.

Pain and injury could be considered 'problems'. How one interprets the problem of pain or injury may contribute to one's ability to find solutions. According to cognitive behavioural theory, individuals' cognitions, beliefs, and coping behaviours play key causal roles in determining their adjustment to pain (Jensen, Romano, Turner, Good, & Wald, 1999; Lazarus & Folkman, 1984). Negative affect such as fear, catastrophizing, learned helplessness, and avoidance response to pain can interfere with rehabilitation efforts or contribute to the chronicity of the injury (Brewer, 1994; Fritz, George, Delitto, George, 2001; Grove, 1993; Weiss & Troxel, 1986; Udry, 1997; Weise-Bjornstal, Smith, Shaffer, & Morrey, 1998). 'Catastrophizing' is a multi-dimensional construct including a tendency to focus excessively on pain (i.e. rumination), to exaggerate the pain (i.e. magnification), and to underestimate one's ability to manage pain (i.e. helplessness) (Sullivan, Bishop, & Pivik, 1995). Mechanisms such as misattribution of arousal, hypervigilance to pain, worrying, and avoidance behaviour can be very adaptive in acute pain situations to prevent injury and promote recovery; in chronic pain; however, ongoing physiological arousal and hypervigilance to pain, induced or magnified by negative affect, may cause sensitization to pain and increase disability long term (Aldrich, Eccleston, & Crombez, 2000; Janssen, 2002; Melzack & Wall, 1982; Reynolds, 1969). Sullivan, Sullivan and Adams (2002) found that duration of injury increases negative affect and adds to negative interpretation of the injury in a recursive, spiraling manner.

Likewise, in the ‘diathesis-stress’ model (Flor & Turk, 1984; Flor and Turk, 1999; Turk & Flor, 1984; Turk & Salovey, 1984), causal attribution can be circular rather than linear. Once the stress and sympathetic arousal activate the dispositional factors, the pain cycle begins, with pain acting as a new stressor that causes increased muscle tension, and the cycle is perpetuated. Therefore, early intervention is considered most effective (Krause, Dasinger, Neuhauser, 1998; Loisel, et al., 1997; Yassi et al., 1995).

Various explanations point to different sources of constraint in problem solving (prior experience, problem display), but many share the view that the locus of problem difficulty is centered on the solver’s constrained representation of the problem or interpretive frame (Ormerod et al, 2002). While anxiety has been targeted as a chief inhibitor of problem solving capacity, Jones et al (1993, 1995) and Scheier and Carver (1988) argued against a causal relationship. Any stressor or challenge can cause arousal or ‘anxiety’. How this arousal is then interpreted determines how effectively an individual will respond to the challenge. In this way Jones et al (1993; 1995) differentiated between facilitative and debilitating anxiety, calling the interpretive factor ‘anxiety direction’. According to the Processing Efficiency Theory (Eysenck & Calvo, 1992; Eysenck et al, 1987) a negative bias or interpretation of a challenge reduces the processing and storage capacity of working memory. Baddeley (1988, 1993) proposed that the working memory system includes a central executive that is involved in active processing, an articulatory loop that is assumed to be responsible for the storage and processing of verbal, visual, and spatial information. When in a threat vigilant state, processing resources will be allocated to perceived threats as opposed to the task at hand. Ohlsson (1992) echoed information processing theory in suggesting that ‘restructuring’

the problem can succeed in activating the relevant operators for solving the problem. Similarly, Kahneman and Tversky (1981) argue that the ‘frame that a decision-maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision-maker’ (p. 453).

### *Appraising the Problem of Pain*

Some individuals appear more psychologically vulnerable to both injury and chronicity of injury or pain. Researchers have documented a number of biopsychosocial risk factors for predicting chronic pain or injury including physical, psychological, behavioural, social, environmental, and quality of life variables that impact both health and well being (Bombardier, Kerr, Shannon, & Frank, 1994; Gatchel, Polantin, & Mayer, 1995; Klenerman et al., 1995; Ohlund, Lindstrum, & Areskoug, 1994; Pincus, Burton, Vogel, & Field, 2002; Sanders, 1995; Turk, 1997; Vlaeyen, Kole-Snijders, Boeren, & van Eek, 1995). As well, the physical, environmental, social and psychological antecedents to injury have been the focus of considerable research (Holmes, and Rahe, 1967; Williams and Roepke, 1993; Williams & Andersen, 1998). In the area of athletic injury, the research showing association between life events stress, anxiety, and athletic injury appears quite robust (see Williams & Roepke, 1993 and Williams & Andersen, 1998 for reviews). In the area of psychoneuroimmunology, there is overwhelming evidence to show that a negative mindset or disposition can have negative effects on the immune system function (O’Leary, 1990). But, while the immune system was clearly identified as the mediating link between life events stress and an increased risk of illness, perceptual deficits (in terms of decreased coping resources, increased negative affect, and increased peripheral narrowing) accounted for 26% of subsequent athletic injury incidence variance

(Andersen & Williams, 1988). While a variety of personal and situational factors influence the way individuals cognitively appraise their situations, how individuals cognitively appraise their situations influences their emotional and behavioural responses making them more susceptible to injury. People in pain, or expecting pain, sometimes bias their attention towards pain-relevant cues. Vlaeyen et al. (1995) explored whether experimentally induced pain, and the expectation of pain, involved an information processing bias towards the hand in question. Both pain and the expectation of pain increased and the findings were consistent with a bias in information processing toward the painful or impending painful hand (Hudson, McCormick, Zalucki, Moseley, 2006).

It is believed that cognitive appraisal can moderate individual ability to cope effectively with injury. Cognitive appraisal models (Wiese-Bjornstal & Smith, 1993; Wiese-Bjornstal et al., 1995, 1998) among injured athletes are rooted in the stress, coping, and self-efficacy literature of general psychology (Bandura, 1977; Cohen & Wills, 1985; Lazarus & Folkman, 1984). Interpretive biases have been demonstrated in the laboratory with materials ranging from homographs (words spelled the same but with different meanings) to social scenarios, and with participants experiencing high levels of trait anxiety as well as a variety of anxiety disorders (Eysenck et al., 1987; Hirsch & Mathews, 2000; Richards & French, 1992). Individuals who perceive themselves as lacking the resources with which to manage their injury are more susceptible to debilitation while people experiencing high anxiety levels do in fact lack the resources to prevent injury. In general it is agreed that pain is heterogeneous in terms of etiological factors, mechanisms and temporal characteristics and that, consequently, treatment must be targeted not at the general symptom, the pain, or its acute or chronic temporal properties, but rather at the

underlying neurobiological mechanisms responsible (Scholz & Woolf, 2002; Woolf & Mannlon, 1999). If one were able to restructure one's cognitive appraisal or interpretation of pain or injury, one may be able to increase one's capacity for rehabilitation, or for pain tolerance. Bum, Morris, and Andersen (1998) found that a simple program of relaxation (autogenic training) for an experimental group resulting in improved perceptual capacity suggesting that simple interventions may help reduce stress responsivity and, possibly, injury risk.

It is commonly agreed that employer participation, a supportive work climate, and cooperation between labour and management are critical to facilitating return to work, yet the problem remains of how to treat the psychologically vulnerable employee, and to what extent the employer is responsible for the psychological health of its employees. While it may be in the best interest of the employer to facilitate rehabilitation of work related injury, exploring the reasons behind each individual's maladaptive behaviours and perceptions would take researchers down a tangled path of infinitely interactive variables, many of which would be far beyond the reach or influence of the researcher, health consultant, or employer. On the other hand, the mechanism of interpretation, beliefs or 'cognitive appraisal' of pain and injury, is generalizable and thus offers a significant point of leverage for rehabilitative intervention (DeGood & Kiernan, 1997; DeGood & Shutty, 1992). Beliefs seem easier to measure reliably and with validity than are coping strategies (SOPA; Jensen, Karoly, & Huger, 1989). Rather than attempting to control life events, personalities, or environments, it may be more encouraging and productive to focus on understanding and ultimately facilitating the cognitive frame required to problem solve pain and injury.

### *Pain, Problem Solving and Failure*

In the area of insight problem solving, MacGregor et al (2001) and Knoblich, Ohlsson, Haider & Rhenius (1999) suggest that experiencing ‘criterion failure’ may induce an impulse to ‘seek alternatives’ while creating ‘a state of preparedness that disposes the solver to attend to solution-relevant information’. People who accept failure and seek to identify the problem that this failure poses for them, are more likely to move beyond a failure to new growth and learning. People who frame the failure as a problem in itself to be solved have less success. A person who has made an error in judgment, lifted a heavy load inappropriately, and induced an injury, may fixate on the failure, and ruminate, refusing to accept it or move on. Appraising pain and injury as a situation or ‘reality’, as a point of failure as opposed to a problem in itself, may be the first step in achieving a state of readiness to see alternative solutions, and in reconstructing their representation of the problem. Pain and injury may not be the problem and in this way, may not be solvable or ‘fixable’, rather, the problem exists in how the pain or injury impacts the individual’s life. Framing the problem in such a way has the potential to shift focus and unlock more creative solutions. For instance, the machinist who sees his lower back injury as the ‘end of life as he knows it’ may try to fix the injury or give up entirely. By reframing the injury as a ‘reality’ over which he has no control (failure), and making the step toward reconstructing the problem in terms of the implications this reality has for him, he may come to understand that the real problem lies not in his lower back injury, but in how he will go about getting retrained, or keeping himself occupied, or developing his other skills, or adapting to his lack of mobility while he waits for the therapy to improve his mobility, or while he strives to reinvent himself as a machinist or as a person.

### *Predicting Interpretive Frame and Pain Treatment Response*

A number of studies have identified subgroups of patients according to psychosocial and behavioral characteristics (Johansson & Lindberg, 2000; Mikail, Henderson, & Tasca, 1994; Turk & Rudy, 1988, 1990b; Turk, Sist, et al., 1998). Several studies (Dahlstrom, Widmark, & Carlsson, 1997; Epker & Gatchel, 2000; Rudy, Turk, Kubinski, & Zaki, 1995) found that patients classified into different subgroups on the basis of their psychosocial and behavioral responses responded differentially to identical treatments. Subgroups of chronic pain patients characterized by a number of psychosocial and behavioral characteristics seem to be fairly consistently observed across different pain syndromes (i.e. cancer, FMS, TMD, headaches, low back pain; Turk & Rudy, 1990b; Turk, Sist, et al., 1998), suggesting the independence of psychosocial factors from the physical pathology.

A number of investigators (Dworkin, von Korff, & LeResche, 1992; Turk, 1990) recommend the use of a dual-diagnostic system: a biomedical diagnosis and a psychosocial diagnosis. Distinctiveness of the psychosocial profiling implies that patients in different subgroups may exhibit differential responses to a treatment. Indeed, this has been demonstrated in several outcome studies. For example, one of the most frequently used pain inventories, the Multidimensional Pain Inventory (MPI; Kerns, Turk, & Rudy, 1985; Piotrowski, 1998), yields a three-subgroup solution. The MPI subgroups were initially developed using the cluster-analytic approach. Turk and Rudy (1988) labeled one subgroup characterized by severe pain, compromised life activities and enjoyment, reduced sense of control, and high level of emotional distress as "dysfunctional. " Another subgroup, also marked with relatively high degrees of pain and affective distress

but further characterized by low levels of perceived support from significant others, was labeled "interpersonally distressed." The third subgroup consisted of chronic pain patients who appeared to be coping relatively well despite their long-standing pain. This group, which experienced low levels of pain, functional limitations, and emotional distress, was labeled "adaptive copers." The subgroups have been replicated and validated in numerous studies (Jamison, Rudy, Penzien, & Mosley, 1994).

There is a growing body of evidence supporting the importance of patients' beliefs in chronic pain. Beliefs about the meaning of symptoms, the patient's ability to control pain and the impact of pain on his or her life and worry about the future are just some constructs that have been shown to play a central role in chronic pain. Such beliefs have been found to be associated with psychological functioning (Jensen, Romano, Turner, Good, & Wald, 1999; Stroud, Thorn, Jensen, & Boothby, 2000), physical functioning (Stroud et al. , 2000; Turner, Jensen, & Romano, 2000), coping efforts (Anderson, Dowds, Pelletz, Edwards, & Peeters-Asdourian, 1995), behavioral responses (Jensen et al. , 1999), and response to treatment (Tota-Faucette, Gil, Williams, Keefe, & Goli, 1993).

Depression, Low activity/high pain behavior, Negative beliefs/fear of pain: These four psychological-behavioral factors have continued to show consistent, empirically supported predictive capabilities (Bombardier, Kerr, Shannon, & Frank, 1994; Gatchel, Polantin, & Mayer, 1995; Klenerman et al., 1995; Ohlund, Lindstrum, & Areskoug, 1994; Sanders, 1995; Turk, 1997; Vlaeyen, Kole-Snijders, Boeren, & van Eek, 1995). Thus, these risk factors have to remain on the list as important predictive variables. The MMPI Scale-3 focuses on patients' reports of sensory or motor symptoms, denial of problems or social anxiety, and feelings of lassitude or malaise (Hathaway & McKinley,

1989). It has not yet been determined which of these factors is involved in predicting disabling low-back pain. The factor of depression primarily is relevant for patients who exhibit clinically significant levels of mood disturbance. The final element in this constellation—negative beliefs or fears about pain—manifests when patients express strong beliefs or fears that their pain is harmful, disabling, or out of their control, or that increasing their activity level (e.g., by returning to work) would increase their pain.

There are few, if any, controlled studies that investigate appraisal and attentional focus as predictors of treatment outcome for sufferers of pain or injury. Pessimistic explanatory style has been shown to predict stressful life events, poor health habits, and decreased feelings of self-efficacy with regard to changing such habits (Peterson, Seligman, & Vaillant, 1988; Seligman, 1989 cave article). It appears that we know more about how people cope poorly with pain than how they cope effectively (DeGood, 2002). Any coping strategy can be seen to be adaptive or maladaptive under particular circumstances. For example, rest may be adaptive in one situation but could lead to atrophy in another. Also, chronic pain disorders seem to be a function of the interaction between an individual's premorbid biological and psychological predispositions (diathesis) and the challenges or stressors (stress) faced as a result of physical or environmental factors (Banks & Kerns, 1996). Thus it would seem more productive and practical to isolate the individual's beliefs and facilitate a change in focus, than to attempt to alter cognition, personality, or situation. Identification of such a frame in patients would allow us to direct our intervention at the psychological as well as the medical factors of significance in treatment (Beck, 1964; Seligman, 1991). Thus, four separate belief quadrants have been identified: belief about the self, belief about the stressor,

belief about the world, belief about others. These variables take the form of self-efficacy, locus of control, perceived optimism, and fear avoidance and contribute to overall cognitive appraisal of a challenge such as workplace injury.

### *Self Efficacy and Locus of Control*

The construct of self-efficacy (SE; beliefs about self and capacity for control) has gained a great deal of attention in the pain literature (Dolce et al., 1986). An SE expectation is defined as a personal conviction that one can successfully perform certain required behaviors in a given situation. Bandura (1977) proposed that given sufficient motivation to engage in a behaviour, it is a person's SE beliefs that determine whether that behavior will be initiated, how much effort will be expended, and how long effort will be sustained in the face of obstacles and aversive experiences. From this perspective, coping behaviors are conceptualized as being mediated by people's efficacy beliefs that situational demands do not exceed their coping resources. People with weak efficacy expectancies are less likely to emit coping responses or persist in the presence of obstacles and aversive consequences than those with positive efficacy expectations.

Mastery experiences gained through performance accomplishments are hypothesized to have the greatest impact on establishing and strengthening perceived SE. Thus, techniques that enhance mastery experiences (e. g. , graded task accomplishments with both physical and verbal feedback) should be powerful tools for bringing about behavior change. Moreover, the patient's self-attribution of success should facilitate maintenance of improvements. If patients feel that there is little they can do to control their symptoms, they will expend minimal effort in trying to use self-control techniques;

conversely, they may become more emotionally distressed, which may amplify symptom perception.

Converging lines of evidence indicate that SE is important in the control of pain (Lorig, Chastain, Ung, Shoor, & Holman, 1989), adaptive psychological functioning (Spinhoven, Ter Kuile, Linssen, & Gazendam, 1989), disability (Lorig et al., 1989), impairment (Lorig et al., 1989), and treatment outcome (O'Leary, Shoor, Lorig, & Holman, 1988). For example, SE seems to have some predictive value for the level of performance of physical tasks in back pain patients (Council, Ahern, Follick, & Kline, 1988). Similarly, SE expectancies were found to closely parallel increases in actual exercise levels during treatment (Dolce, Crocker, Moletteire, & Doleys, 1986). Furthermore, post-treatment SE ratings were correlated significantly with reduction in medication use and return to work at follow-up periods ranging from 6 to 12 months (Dolce et al., 1986).

Additionally, patients' anticipation of pain during and following physical tasks seems to interact with SE, collaboratively determining the level of performance. The influence of SE extends to pain reports, depression, and disability in chronic pain patients (Lorig et al., 1989). Furthermore, improvement in SE has been associated with improvement in pain, disability, and mood (Keefe et al., 1997; Smarr et al., 1997). In short, SE appears to play a particularly important role in perception of and adjustment to pain and subsequent disability. Cioffi (1991) suggested that at least four psychological mechanisms could account for the association between SE and behavioral outcome: (a) Because perceived SE decreases anxiety and its concomitant physiological arousal, the patient may approach the task with less potentially distressing physical information to

begin with; (b) the efficacious person is able to willfully distract attention from potentially threatening physiological sensations; (c) the efficacious person perceives and is distressed by physical sensations but simply persists in the face of them (i.e. displays stoicism); and (d) physical sensations are neither ignored nor necessarily distressing but rather are relatively free to take on a broad distribution of meanings (i.e. change interpretations).

There are several ways in which perceived coping efficacy can contribute to relief from pain. People who believe they can alleviate suffering will likely mobilize whatever ameliorative skills they have learned and will persevere in their efforts. Those who doubt their controlling efficacy are likely to give up readily in the absence of rapid results. A sense of coping efficacy also reduces distressing anticipations that create aversive physiological arousal and bodily tension, which only exacerbate pain sensation and discomfort. In 1975, Wortman and Brehm observed that reactance and learned helplessness each sometimes followed exposure to uncontrollable outcomes and proposed that expectations of control determined which reaction would occur. If an individual maintained an expectation of control, reactance would result, manifest in behavioral assertion and hostile feelings. If one came to expect no control, then learned helplessness, with its depression like affect and behavior, would result. The studies Wortman and Brehm reviewed provided tentative support for this formulation.

Nearly two decades later, Mikulincer's (1994) review of the subsequent literature led him to conclude that high expectancy of control is indeed a determinant of anger and increased problem-focused coping, and that an expectancy of no control is a determinant of anxiety, depressed affects, and learned helplessness deficits. Subsequently, Roseman et

al. (1996) found that believing there was something one could do about an event distinguished recalled experiences of emotions such as frustration and anger (characterized by high coping potential) from emotions such as fear, sadness, and distress (characterized by low coping potential). Roseman (2001) found that experiences of these same emotion groups were distinguished by three measures of high versus low control potential.

Bandura (1977) suggested further that those techniques that enhance mastery experiences the most will be the most powerful tools for bringing about behavior change. He proposed that cognitive variables are the primary determinants of behavior but that these variables are most influenced by performance accomplishments. Thus, SE may play a role in fear avoidance. Exposure to feared activities without the negative consequences anticipated may reduce that fear while at the same time increasing perceived SE. Pain sufferers who avoid activity because of fear of pain, injury, or re-injury will never receive corrective feedback or information that can enhance their sense of SE—that is, the knowledge that they can successfully confront the feared activity without the dire consequences they anticipate. Again, attempting to change an individual's appraisal of resources (i.e. their ability to confront a feared activity) may prove less productive than understanding the problems that such an appraisal creates for the individual. Helping individuals to link their negative self efficacy beliefs to their goals (i.e. what problems does the fact that I do not have the personal resources to manage this stress create for me?) will help them to unlock creative solutions for achieving their goals as opposed to focusing on trying to increase their resources or change their self efficacy beliefs which can prove to be frustrating and fruitless.

### *Fear Avoidance / Threat Vigilance*

Because fear is a natural consequence of pain, avoidance of a fear-provoking event is reasonable for acute pain but may serve as an impediment to recovery from chronic pain. In chronic pain, pain-related anxiety and fear may actually accentuate the pain experience (Crombez, Vlaeyen, Heuts, & Lysens, 1999). Chronic pain patients with elevated pain-related anxiety tend to anticipate higher levels of pain than those with low anxiety, and anticipation of pain often results in poorer behavioral performance (McCracken, Gross, Sorg, & Edmands, 1993).

When people with pain symptoms are exposed to a feared situation (e. g. , walking up a flight of stairs), some experience a cascade of avoidance responses, including a cognitive response, worry (McCracken & Gross, 1993); effort to escape and avoid increased pain and exacerbation of injury (Crombez, Vervaeke, Lysens, Eelen, & Baeyens, 1998; Crombez, Vlaeyen, Heuts, & Lysens, 1999; Vlaeyen, Haazen, Schuerman, Kole-Snijders, & van Eck, 1995); and self-reported disability (Crombez et al., 1999). Fearful patients appear to attend more to signals of threat and appear to be less able to ignore pain-related information (Crombez et al., 1999).

Waddell and colleagues (1993) reported that fear avoidance (beliefs about stressor) of physical activities and work tasks is more strongly associated with disability and work loss during the previous year than are biomedical variables and characteristics of pain. They concluded that "fear of pain and what we do about it is more disabling than the pain itself" (Waddell et al. , 1993, p. 164). Several authors (Hildebrandt, Pflingsten, Saur, & Jansen, 1997; Mayer & Gatchel, 1988) have argued that patients with chronic back pain often demonstrate prolonged iatrogenically abetted protectiveness and passivity,

largely induced by fear. The result is likely to be a decrease in spinal mobility, muscle strength, and cardiovascular fitness, and ultimately an increase in disability. Klenerman et al. (1995) demonstrated that fear avoidance was one of the most powerful predictors of chronic disability in back pain patients. In fact, Vlaeyen, Kole-Snijders, Boeren, & van Eck (1995) observed that fear of reinjury by activity was a better predictor of self-reported disability than were biomedical signs and symptoms or pain severity.

Furthermore, Vlaeyen and colleagues (Vlaeyen, Haazen, et al., 1995; Vlaeyen, Kole-Snijders, et al., 1995) found a strong association between pain-related fear and increased physiological arousal. Physiological arousal might contribute to maintenance and increase in pain severity (Flor & Turk, 1989). Burns, Wiegner, Derleth, Kiselica, and Pawl (1997) and Vlaeyen et al. (1999) demonstrated that fear-induced increases in lower paraspinal muscle reactivity predicted greater pain during subsequent physical performance tests.

Finally, McCracken and Gross (1998) reported that reduction in pain-related anxiety predicted improvement in functioning, affective distress, pain, and interference with activity. Woby, Watson, & Roach (2004b) found that hierarchical multiple regression analyses revealed that patients' perceptions of their ability to decrease pain explained a small, but statistically significant, proportion of the variance in pain intensity. In addition, patients' levels of catastrophizing, as well as their fear-avoidance beliefs about both work and physical activity, were independently associated with levels of disability. Interestingly, however, when exploring the relative predictive utility of these three psychological factors, it became evident that fear-avoidance beliefs about physical activity (FABs-PA) were the only significant predictor of patients' disability. Woby,

Watson, & Roach (2004a) also found that reductions in fear-avoidance beliefs about work and physical activity, as well as increased perceptions of control over pain were uniquely related to reductions in disability, even after controlling for reductions in pain intensity, age and sex. It appears that fears, pain-related anxiety, and concerns about harm avoidance all play an important role in chronic pain. Thus, it is appropriate to address these factors when treating chronic pain patients.

It is not clear why fear during the acute phase is extinguished for some but becomes a chronic factor for others. One plausible hypothesis is that premorbid individual differences may modulate this process. A good deal of attention has been given to the potential predisposition of negative affectivity and anxiety sensitivity in fear related to pain symptoms (Asmundson & Norton, 1999). Negative affectivity, the general tendency to experience subjective distress and dissatisfaction, has been demonstrated to be associated with elevated symptom reporting by chronic pain patients (Vassend, Krogstad, & Dahl, 1995). Other explanations for the inability to extinguish fear by some patients include differences in prior learning history and the normal distribution of sensitivity to noxious stimulation. These explanations are not mutually exclusive. The results of future studies may help us to understand better the individual variability observed (Turk and Okifuji, 2002).

#### *Perceived Optimism*

The anticipation of success or failure is believed to influence behaviour and outcomes. The work of Bandura (1977), who viewed optimism (beliefs about environment and others) as highly influenced by a sense of self efficacy, illustrated the belief that positive expectations mediate stress. The anticipation of positive outcomes will sustain, and

possibly re-energize, one's goal-directed efforts in situations with undetermined outcomes, possibly due to the effects described by Eysenck and Calvo's Processing Efficiency Theory (1992). A key assumption underlying the processing efficiency theory is that emotions such as anxiety, worry and self-concern, use up available processing resources and, consequently, reduce the resources and storage capacity available in working memory for the task at hand (Baddeley, 1986, 1990).

The anticipation of negative outcomes can debilitate efforts toward an intended goal (Scheier, Weintraub, & Carver, 1986). Schwarzer (1994) noted that framing one's expectation in a positive light can lead to two different effects: functional and defensive. Functional optimism or learned optimism infers that external, variable and specific attributions are used to describe an event (Seligman, 1991). Dispositional optimism refers to the optimists tendency to anticipate positive outcomes and, in doing so, behave in a manner that increases likelihood of success (Scheier & Carver, 1985, 1992). Schwarzer's (1994) defensive optimism, an unrealistic estimation of one's personal control over life's events, predicted better adjustment to disease (Pettingale, Greer, Morris, & Haybittle, 1990; Reed, Kemeny, Taylor, Wang, & Visscher, 1994), greater likelihood of returning to prior level of functioning (Taylor & Armor, 1996), and more successful adjustment to adverse experiences, including life-threatening traumas and disease (Bulman & Wortman, 1977; Taylor & Armor, 1996; Taylor & Brown, 1988). The power of optimistic interpretations of life events and situations to have a positive effect on both psychological and physical well-being, supports the view that positively framing a problem may contribute to its resolution.

As David Butler and Lorimer Moseley point out in their book *Explain Pain* (2003), pain is not pain if it is not perceived as pain, and pain relies upon context. Whether physical or mental, an emergency raises cortisol production. ACTH hormones are released which then increases cortisol. Cortisol, the stress hormone, then puts the body and mind in a hyper vigilant 'high alert' state. Health professionals treating people with workplace injuries have discovered that understanding the neurophysiology of pain is important to patient recovery. In fact, a poor knowledge of currently accurate information about pain and the underestimation of patients' ability to understand currently accurate information about pain represent barriers to re-conceptualization of the problem in chronic pain within the clinical and lay arenas and inhibits recovery (Moseley, 2003). It is recommended that because of the multi-factorial nature of pain, a multidimensional treatment approach to injury is preferable (Burton et al., 1999; Middleton & Pollard, 2005; Moseley, 2004; Trief, Grant, & Fredrickson, 2000)

Moseley (2002) defines chronic pain as part of a multi-system output that motivates and assists the individual to get out of a situation that the brain perceives to be threatening body tissue. Pain-specific neurons called nociceptors are stimulated by tissue at risk to danger. More recent evidence demonstrates that nociceptors are the neurons that transmit pain signals to the brain, and that the frequency of their transmission of signals is not proportional to the amount of tissue damage that has occurred. It is therefore important to teach clients about pain in order to reduce catastrophic thinking, and eliminate the belief that pain is uncontrollable or that pain equals damage. The brain uses a complex set of mechanisms to determine how dangerous the threat is. It uses various sensory input from the body such as previous experience, cultural factors, expectation

about consequences of danger and/or pain, the social/work environment, as well as beliefs, knowledge and logic, to determine the level of the threat. The brain then produces a multi-system response after the level of threat is determined, and the motor, endocrine, pain production, immune, parasympathetic and sympathetic nervous systems respond to the threat. Once the multi-system response has occurred, the body prompts you to take action by removing the danger. After action is taken, the brain will determine whether the action taken is sufficient, or if more action is needed, thereby increasing or decreasing the sensation of pain.

Trief et al. (2000) through regression analyses found a strong predictor of chronic low back pain to be a combination of the Zung Depression Scale and Modified Somatic Perception Questionnaire, known as the Distress and Risk Assessment Method (DRAM). These results indicate that screening for presurgical distress is likely to identify those patients at risk for poor outcome and suggest that studies to evaluate whether presurgical psychological treatment improves outcome are warranted. Further analyses demonstrated that the relationship between changes in pain-related anxiety and treatment outcome were independent of changes in physical capacity performance. Changes during treatment in pain-related anxiety may be more important than changes during treatment in physical capacity when predicting the effect of treatment on behavioural outcome measures (McCracken, Gross, & Eccleston, 2002).

It is hypothesized that these four factors (self efficacy, locus of control, optimism, and fear avoidance) would combine and interact to produce an individual's interpretive frame of a problem situation. The interpretive frame would determine then how that individual composes the problem thereby mediating ability to see or recognize

sustainable solutions. In terms of chronic pain or injury, it is hypothesized that an individual's array of beliefs would influence their ability to frame the injury / pain as a problem that is within their capacity to solve.

A problem finding intervention capable of shifting an individual's problem frame to that of a more integrated focus would simultaneously achieve the resolution of anxiety that enables the mental readiness to see and recognize the initial goal and lead to the identification of sustainable solutions to achieving that goal.

#### A Proposed Approach: Integrated Focus

Facilitating failure seems ridiculous, as does asking people to accept that they have no control over a perceived threat; however, by incorporating the perceived threat into the performance goal reality, one attends to the threat but within a goal frame. Acknowledging the threat by exploring the challenges that it poses relative to the goal, or its 'symptoms', may also serve to satisfy the individual's desire to resolve the threat. Resolving the challenges posed by a perceived threat is very different from resolving the threat itself. For instance, trying to resolve the 'wet conditions' on a soccer field is likely debilitating to performance as the player attempts to 'stay focused' or 'block out the rain.' Such a threat focus is very different from exploring the challenges the 'wet' poses to the soccer player (i.e. decreased ball control, decreased speed and agility). When framed as part of the goal, more specific and facilitative solutions emerge such as wearing longer cleats for greater traction and being ready for less predictable ball movement. Focusing 'sharply upon the goal' has been shown to facilitate performance in a variety of studies (Beilock & Carr, 2001; Bond and Bunce, 2000, 2003; Driskell, Salas, Johnston, 1999; Hayes, et al, 2001; Higgins, Shah, Friedman, 1997; Friedman & Forster, 2001;

Selvaratnam & Mazibuko, 1998; Wan & Huon, 2005; Wulf & McNevin, 2003).

Therefore, focusing on threat ‘symptoms’, or the challenges and problems a perceived threat creates for the individual, should bring the individual closer to a goal focus while making still addressing the threat (Figure 2).

## **CHAPTER 3 RESEARCH METHODOLOGY**

### **Introduction**

This chapter describes the theoretical framework guiding the study and the overall design of the study including quantitative and qualitative methods utilized for gathering data. The selection of independent and dependent variables and measures is discussed along with ethical considerations. The main purpose of the present work was to discover whether it was possible to increase problem solving performance outcome by shifting an individual's focus from a barrier or goal focus. "Perspective transformation is the process of becoming critically aware of how and why our assumptions have come to constrain the way we perceive, understand, and feel about our world; changing these structures of habitual expectation to make possible a more inclusive, discriminating, and integrating perspective; and, finally, making choices or otherwise acting upon these new understandings" (Cranton, 1994, p. 22). A more integrated focus may serve to enhance performance by attending to the challenges a barrier poses to a goal while sustaining a goal focus overall.

## Selection of the Variables

### *Independent Variables*

#### *Attentional Focus*

As explained in the literature review, attentional focus appears to offer leverage in determining problem solving outcome. Therefore training conditions were designed to manipulate participant focus to goal focus, assumption focus, integrated (barrier and goal) focus, and a control focus condition.

Likewise in a field situation in which workers are faced with the challenges of workplace injury or illness, insight may serve to unlock creative and sustainable solutions for supporting recovery and rehabilitation despite physical, emotional, professional, and

mental barriers posed by the workplace injury or illness. Focusing on barriers presented by a workplace injury or illness may have the same ‘fixating’ effect and lead to chronicity or re-establishment of the injury or illness, a vicious cycle.

### *Problem Type*

Another condition applied within the experiment included problem type (puzzle or realistic). It has been shown that a more realistic or ‘experiential’ task can provide for more productive understanding, learning, and problem solving (Boyatzis & Kolb, 1991; Kolb, 1984; Zull, 2004). Within the framework of this study, a realistic problem should enhance problem solving ability by helping participants to frame the problem in terms of a goal focus more clearly and draw upon knowledge and skills more readily. Familiarity with the problem components (i.e. a clamp, a molecule, a light fixture) should hypothetically enhance participants’ performance.

Alternatively, it could be argued that familiarity may breed ‘fixation’ and lack of creativity (i.e. a screw only moves one way, a clamp only works one way). Successful experiments begun as early as the 1920s by Gestalt psychologists Karl Duncker and, later, Abraham Luchins demonstrated that habitual use of familiar objects and problem-solving strategies limits the ways individuals employ them. Psychologist Jennifer Wiley (1998) revived this work with a study investigating the relation between expertise and blindness to alternatives.

Gary Johns (2006), in his study of ‘context’ and its impact on organizational behaviour, defines context as ‘situational opportunities and constraints that affect the occurrence and meaning of ... behavior as well as functional relationships between variables’ (p. 387). Johns argues that seemingly innocuous contextual variables can have

rather marked effects while apparently strong contextual stimuli can have little or no impact depending upon countervailing and supportive forces. Therefore, adding a realistic dimension to the problems in one condition may help or hinder problem solving ability.

Of course, the central issue is whether an attentional focusing intervention would apply in a more realistic setting. While solving puzzles demonstrates a certain skill set that, it may be argued, will extend and apply to more realistic settings, the true test of any intervention is whether the intervention indeed has practical applications and tangible results for solving real world problems within environmental, organizational, political, social, educational, and health scenarios. Thus a more realistic context was provided for the problems as one of the conditions in experiment 1. Finally for experiment 3, to extend the concept of context more fully the problem gained a fully realistic context in that participants faced the challenges of workplace injuries.

#### *Dependent Variables*

##### *Insight in the Laboratory: Problem Solving Ability*

Many cognitive psychologists agree that insight plays a necessary role in the development of creative solutions (Dominowski, 1995; Ohlsson, 1992; Knoblich, Ohlsson, Haider, & Rhenius, 1999; Schooler & Melcher, 1995; Sternberg & Davidson, 1995; Sternberg & Lubart, 1996). The study used insight problems as the dependent variable for the first two experiments. Performance on insight problem solving may be seen as a critical factor to overall creative problem solving ability. Performance was measured in terms of time to solve each problem.

The concept of insight seems to capture the total mechanism we seek in aiming to determine how a person creatively solves a problem: Creative problem solving requires a certain shift in thinking or letting go of assumptions about the problem and its potential solutions characterized as insight or the ‘aha’ moment. While many have suggested ways to achieve a new view of the problem (Clement, 1982, 1991; Newell and Simon, 1972; Schoenfeld, 1982; Schoenfeld and Hermann, 1982) it is not clear how to facilitate a more ‘penetrating’ view of the problem, a view of the problem that then prepares the mind to notice the insightful breakthrough, ‘aha’ or ‘outside of the box’ solution. The insight mechanism is of particular interest due to implications for related areas of creativity, learning, and performance. Insight problem solving has been characterized in various ways: For Schooler, Ohlsson, and Brooks (1993), insight involves

- a) a solution well within the competence of the average subject;
- b) a high probability of an ‘impasse’, that is, a state in which the subject does not know what to do next; and
- c) an ‘Aha!’ experience resulting from sustained effort in which the impasse is suddenly broken and insight into the solution is rapidly attained.

Theorists argue that the key to facilitating insight is constraint relaxation (Ohlsson, 1984; 1992). Constraint relaxation is based on the idea that an impasse can be broken if certain constraints can be relaxed. The author would argue within this study that relaxing constraint is not automatic. In fact, the process of relaxing constraints may be more complex than is presumed and may represent the crux of problem solving. Thus it was hypothesized for the current study that a more integrated focus and definition of the problem may serve to relax the constraining barrier focus. For example, opening a door is

normally subject to the constraint that the door should not become damaged in the process. In an emergency, it might be necessary to relax this constraint and break through a locked door. In this type of situation, problem solving might be less a matter of searching among possibilities than of redefining what to search for. To break through a locked door in time, one should perhaps search for an axe rather than a key. Knoblich et al. (1996) argue that arriving at the need to search for an axe requires that the constraint to avoid damaging the door be relaxed by realizing that it does not matter if the door is damaged; whereas in this study it is argued that shifting one's focus from the barrier itself (it's locked!) to the problem the locked door poses to one's goal of reaching safety (we can't get through!) would help one to define the problem in a way that promotes more productive solutions (the problem is we need to get through, how can we smash the door!?).

Other theorists argue for domain specificity in insight problems (Dow & Mayer, 2004). According to the domain specific theory of problem solving, insight problems can be broken down into coherent subcategories such as verbal, mathematical, and spatial insight problems, each requiring a different kind of problem-solving strategy. Problem solving domain-specificity relates as well to general activities in daily living, social types of problems, and interpersonal problems (Berg & Klaczynski, 1996; Blanchard-Fields, Jahnke, & Camp, 1995; Marsiske & Willis, 1995). As well, problems have been divided in terms of ill-defined or non-routine (offering a wide variety of solutions) and well-defined or routine (requiring a specific solution) types of problems (Barron, 1988; Hennessey & Amabile, 1988; Metcalfe, 1986; Metcalfe & Wiebe, 1987).

Domain specificity in insight problem solving is based upon evidence from the psychometric literature illustrating differences in verbal, spatial, and mathematical ability (Carroll, 1993; Sternberg, 2000). Using cluster analysis, Dow and Mayer (2004) found that problems tended to loosely fall within 4 categories (spatial, verbal, mathematical, and a mixed spatial-verbal) with some problems straddling two categories or clustering in unanticipated manner (i.e. 8 a priori identified verbal problems emerged within the mathematical cluster). Likewise, depending upon the listener a spatial problem may contain verbal elements. Dow and Mayer did find validation of their hypothesis that training in one type of problem did not transfer to other types of problems, therefore the aim of this study included testing for clustering of problem types as well as comparing training effect across problem types.

*Insight in the Field: Pain and Rehabilitation Measures*

In a field situation such as an organization, athletic arena, or academic classroom, problem solving can be seen as a fundamental to determining performance outcome. An area of particular relevance to problem solving is that of pain, injury and illness management. Often, a workplace injury is both stressful and a challenge. In many cases of workplace illness and injury, a small proportion of cases (<10%) accounts for most of the costs (>70%) (Dionne, et al., 2005). Workplace illness and injury is definitely a problem for the organizations in which it occurs as well as a problem for the health systems that attempt to manage and support it. The article cites key research findings indicating that while the number of the most serious workplace injuries continues to decrease, those accidents continue to hit employers' bottom lines hard in the U.S. The rate of growth in the cost of these injuries slowed significantly to 0.7% in 2003 from 6.5% in

2002 after adjusting for inflation (Armes, 2005). The average lost-time injury costs Ontario employers about \$59,000 each. The Board says if a business operates on a 6% profit margin, it would take almost \$1 million in sales to make up for that (Benefits Canada, 2002).

The ability to problem solve a workplace injury or illness therefore has individual, organizational, and societal ramifications. In their study of a non-curable health disorder called Tinnitus, Sirois, Davis and Morgan (2006) found that those people who make “the appropriate shift in focus” by surrendering control over the uncontrollable aspects of a chronic illness and adopting control over the more manageable aspects of one’s health (i.e. symptoms) reflect a situational type of power that facilitates psychological adjustment (p. 123). Insight may play a significant role in the problem solving and rehabilitation outcomes of workplace injury and illness sufferers. If an injured or ill worker can develop the insight to first frame their challenge in terms of both barriers and goals, and second generate sustainable and productive solutions to address this more precisely defined challenge, they are better equipped to rehabilitate.

Drawing the individual’s focus back to the initial challenge or goal, the initial barriers identified, and the problems or threats to return to work goals that the barrier poses for the individual, should cause the individual to let go of the desire to increase control over their illness or injury because focusing on problems generated by the injury offers personal points of control to the individual. For instance, if an individual is attempting to increase mobility within two weeks of a back injury, and the barrier is the physical pain that she must endure in order to do so, rather than focusing the barrier or pain in this case, and trying to increase one’s control over the pain by ignoring or

blocking it out, it may be more effective to first identify and then resolve the problems pain can cause: problems pain might cause an individual suffering from a back injury include the threat of re-injury due to improper movement, a desire to stop, a reduction in effort in order to reduce the pain. Shifting focus to ways in which knowledge of physiology, focus, persistence, and effort can be sustained without incurring re injury may prove much more productive in terms of recovery than attempts to ‘push through’, ‘ignore’ or ‘succumb’ to the pain. In terms of intervention, it may be most productive to utilize the power of focus by facilitating a focal shift, rather than attempting to engender acceptance of negative feelings associated with or a lack of power over the return to work barrier.

A measure of insight in the field component of the study was captured quantitatively in terms of rehabilitative success by the Oswestry Disability Scale (ODI; Fairbank, et al., 1980) pre and post rehabilitation program, and qualitatively in terms of the nature of appraisal, attentional focus, and problem solving strategies generated throughout the intervention.

### Research Design

Using an experimental and quasi-experimental field study approach, and both between and within-participant design, the study evaluated relationships between focus, appraisal, and performance as well as the strength of attentional focus direction to predict cognitive appraisal, coping, and performance/problem solving outcomes. The dependent variables in the study were measures of problem solving performance approach and outcome and the independent variable was direction of attentional focus and, for experiment 1 only, problem type. Attentional focus was manipulated using a series of

questions designed to shift attentional focus to one aspect of the performance or problem solving scenario (goal, assumption, and integrated focus).

The study involved three experiments. The first experiment was a 4 x 2 design ( $N = 80$ ) evaluating the impact and interactions of 4 training conditions (control, assumption, goal, integrated) designed to manipulate attentional focus and 2 problem conditions (puzzle problems and realistic problems) within 8 groups ( $n = 10$  per group). The second experiment used analysis of variance ( $N = 40$ ) evaluating the impact of 2 more complex attentional focus training conditions (control, integrated) within 2 groups ( $n = 20$ ) using puzzle problems only. The third experiment was conducted in a field setting in which workplace injuries represented the problem of participant challenge. The experiment ( $N = 60$ ) evaluated the impact of the previous 2 complex attentional focus training conditions (control, integrated) within 2 groups ( $n = 30$ ) using workplace injuries as the problem and disability as the outcome or dependent variable.

Participants for the first two experiments were students. The third experiment sample was comprised of injured workers participating in workplace injury rehabilitation programs. The subjects were assigned randomly to control or condition groups.

### *Threats to Validity*

#### *Potential Threats to Internal Validity*

The disability measure (ODI) was evaluated for construct, convergent and discriminant validity. The Oswestry Disability Index (ODI) is a 10 section questionnaire evaluating a number of realms of disability (i.e. pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, traveling, and changing degree of pain). The ODI asks participants to choose from a series of 6 multiple choice answers that

describe them that day (i.e. the pain comes and goes and is very mild to the pain is severe and does not vary much). The ODI has been shown to yield reliable measurements which are valid for inferring the level of disability, and to be sensitive to change over time for groups of patients with pain (Di Favio, et al, 1996; Fairbank, et al, 1980; Harwood, 2001; Hart, 1998; Loisel, et al, 1998; Parkes et al., 2003; Poitras, 2000). As well, Wind et al (2005) conducted a systematic review of 12 studies evaluating functional physical assessment tools, and found that the RMQ, the Pain Disability Index (Tait, Chibnell, & Krause, 1990), and the ODI were all rated high in reliability, both in the intra-class consistency correlation and on the test-retest. As well, validity was high for these three instruments, especially on construct validity. The ODI showed high responsiveness to change (Fairbank, et al, 1980). For the purposes of this study, the ODI was chosen for its reliability and validity as well as for practical reasons over the Roland Morris or Pain Disability Index because the ODI is shorter and thus more likely to be completed yet more comprehensive. In a pilot study with a similar sample, it was found that a lengthy questionnaire was prohibitive for some participants. The ODI also applies to a wider variety of injuries or pain symptoms, whereas the RMQ is relevant to mostly low back pain sufferers.

Potential threats to internal validity include the fact that a number of personal socio-economic-emotional-physiological factors may also impact an individual's ability to cope effectively on a day to day, moment by moment basis. To combat the threat of infinite confounding variables, state measures were used (i.e. what problems does this performance barrier cause you at this time?) and focus was the independent variable allowing the researcher to facilitate a purely individual and of the moment response to the

challenge. Sample size was designed to allow for a variety of socio-economic-emotional-physiological factors while ensuring a measurable effect for the focusing intervention. The individual described his/her own perceived barriers as opposed to having a solution thrust upon him/her, and coping was measured 'within person' taking into account rather than trying to control for the infinite personal variables impacting appraisal and focus mechanisms. Richard Lazarus (2000) considers within person measurement and day to day analyses to be hallmarks of the best short-term research on stress, coping, and the processes whereby emotional reactions occur and affect social functioning. The intervention of shifting focus in order to facilitate an enlarged focal frame and a 'letting go' of efforts to control barriers also emphasizes a fluid tool or process that is adaptable to any individual performance experience. A large enough sample ( $N = 80$ ,  $N = 40$ ,  $N = 60$  for each experiment respectively) provides the between person measurement desirable.

Other threats to internal validity that randomization of experimental groups does not rule out include: imitation of treatments, compensatory equalization, compensatory rivalry, and demoralization in groups receiving less desirable treatments. Imitation of treatments was highly unlikely in this study as the participants were from a wide range of organizations and employment situations and were entering the program at random due to injury or illness. Participants had virtually no opportunity or reason to communicate about the treatment and were not be able to distinguish between differences in treatment at any rate due to the subtlety of the focusing intervention and relative similarity of questions.

Because the participants derived from various regions, organizations, and environments and entered the programs individually, the chance that the study 'treatment'

was recognized and assessed by participants as ‘desirable’ is negligible as described above.

Finally, ambiguity about the direction of causal influence is of particular interest and threat in this study. Whether appraisal causes coping or coping style causes appraisal is worth consideration in view of this study’s purposes. In their evaluation of the Coping Strategies Inventory instrument, Rosenthal & O’Keefe (2005) found that when they controlled for ‘catastrophic thinking’ and ‘self efficacy’ items, coping did not predict outcome. However, when they controlled for coping strategies, the self efficacy and catastrophic thinking items did predict outcome. The current study explored the relationship between appraisal, coping and outcome as well as their interaction, and in particular aimed to evaluate the predictive utility of appraisal of appraisal, i.e. what is the degree of threat, harm/loss, or challenge posed by a lack of resources or control over a threat, harm/loss, or challenge?

#### *Potential Threats to External Validity*

External validity refers to the approximate validity with which conclusions are drawn about the generalizability of a causal relationship to and across populations of personas, settings, and times (Cook & Campbell, 1979). Potential threats to external validity within the study included the within person research design for measuring appraisal and coping, suggesting that any causal relationship found would represent a sample of only one. However, the research also drew on a sufficient number of participants to permit generalizations beyond a sample size of one. While the study explored within person accounts of appraisal and coping, it was concerned with the focusing mechanism as a mediating variable between appraisal and coping response, a

variable that is more generalizable across times, settings and populations because it is a mechanism as opposed to a state or trait characteristic.

A second threat to external validity is the interaction of selection and treatment. For instance, volunteers for an experiment expected to travel downtown would be atypical to volunteers approached over the phone. In this case, volunteers for the experiment were all previously mandated to participate in a return to work rehabilitation program by their employment contract. The study was conducted at the place of their program making it both convenient and unobtrusive. Participants were expected to fill out questionnaires as part of their rehabilitation program and to be interviewed by a psychologist on occasion, therefore the study components of survey and interview were not far beyond their experience within the rehabilitation program making it unlikely that only 'do-gooders' will volunteer.

Another threat to external validity is interaction of setting and treatment. Can the results of experiment 3 be generalized across different settings (such as athletic rehabilitation programs, organizations that do not have rehabilitation programs, hospitals), across types problems and types of injuries and illnesses (such as cancer, mental illness), across level of problem and level of injury or illness (chronic vs acute), across gender? Can insight problem solving be generalized across more realistic problem solving scenarios? The solution would be to attempt to replicate the studies in a variety of settings as was done by Roesch and Rowley (2005) when examining the validity and reliability of the Stress Appraisal Measure in comparing results between adolescents and adults. The present study must also acknowledge that the results apply to specific problem solving

and rehabilitation situations. As stated, the objectives of the current study were to gain insight into predicting and overcoming barriers to return to work and to problem solving.

A final threat to external validity would be interaction of history and treatment. For instance, it is important to ensure that results can be replicated over time and are not due to the influence of a particular event or circumstance. Participants in the present study completed the problems and the interview individually and at different times based on their intake into the experiments.

#### *Obstacles to Conducting a Randomized Experiment*

Obstacles to conducting a randomized experiment in this setting include withholding the treatment from the control group. The solution is that the control group does not suffer a loss or threat by their omission from the intervention. As well, the intervention is designed only to give insight into the variables at work in the appraisal, focus, coping response framework and is not designed to enact any large scale transformation per se. It is hypothesized that with training, such an intervention process could be learned and applied over many instances and therefore impact overall problem solving outcome, but it is highly unlikely that one instance of refocusing will suffice to completely change the participants general approach to their problem solving barriers. Finally, the results were not used to determine employment, academic, or rehabilitative status.

The threat of self selection to treatment or control group is negligible because both treatment and control participants experienced interviews making it very difficult to discern between groups. The opportunity for subjects to converse about the differences

between groups was very low as the participants were finished the intervention before they had an opportunity to discover differences in treatment.

Heterogeneity in the extent of the treatment is sustainable because each ‘treatment’ consists of one interview only. Guiding questions were followed to ensure that treatments were as standardized as possible.

The threat of treatment in the no-treatment control group is minimal because the treatment does not rely on any level of stasis or expected state within the individuals being treated. The intervention was designed to respond to the participant’s appraisal of barriers in the moment and did not require that the individual be or think anything in particular.

Finally, the threat of obtrusiveness is minimal in that the nature of the treatment is not far beyond the normal experience of a participant’s experience.

#### Ethical Considerations

Written consent (Appendix A) was required from all participants in the process in accordance with the Tri-Council Policy Statement (TCPS) and the University of Victoria Human Research Ethics Board (HREB). The informed consent process involved:

- A statement to the effect that the individual was being invited to participate in a research project.
- A comprehensible statement of the nature of the research project, the identity and institutional affiliation of the researcher, a description of the type of questions to be asked, and an accurate estimate of the time entailed.
- A statement clearly outlining the potential risks and benefits (i.e. There are no known or anticipated risks to you by participating in this research. There are no known

or anticipated risks to you by participating in this research. The potential benefits to you include the possibility of improving performance for others and for yourself).

- A clear statement that participation is voluntary and may be withdrawn without penalty.

- A clear statement that participation is anonymous and confidential; however, while all information will be treated with a certain degree of anonymity, anonymity is not entirely possible when using the interview method because of the researcher/participant relationship required.

The researcher maintained appropriate anonymity in creating, storing, accessing, transferring and disposing of records under her control, whether these were written, automated or in any other medium. As well, to ensure privacy at the time of data collection, experimental sessions were conducted in a private office. All participants remain anonymous in reporting the results of the study and, due to the nature of the data, it is impossible to link constructs to a specific participant. Both individual names and that of the organizations are not mentioned in the data collection or study report.

A brief description of how the findings will be disseminated, a statement to the effect that the individual may contact the researcher or the Associate Vice-President of Research at the University of Victoria with questions or concerns (the contact information will be provided), and a written copy of the consent protocol, complete with contact information, was provided to respondents.

## CHAPTER 4 EXPERIMENT 1

### Introduction

Experiment 1 involved the delivery of an intervention based upon a series of questions designed to manipulate participant focus on several problem solving tasks. Conditions included goal focus, integrated focus, assumption focus and control focus. Problem type was also manipulated creating two additional conditions of realistic problems and puzzle problems.

### Experiment 1 Participants

The participants were 80 students (51 female, 29 male) deriving from a variety of departments within one university who volunteered to take part in the experiment in response to email and poster requests. Participants were given \$20.00 to participate and provided signed informed consent (Appendix A) prior to partaking in the experiment. Participation was restricted to English speakers due to the complexity of the task instructions. Descriptive statistics follow (Table 1).

Table 1

*Experiment 1 Sample Distribution for Gender and Faculty According to Training Group*

---

|        |        | Training |            |      |            |       |
|--------|--------|----------|------------|------|------------|-------|
| gender |        | control  | assumption | goal | integrated | Total |
|        | male   | 8        | 5          | 4    | 6          | 23    |
|        | female | 12       | 15         | 16   | 14         | 57    |
| Total  |        | 20       | 20         | 20   | 20         | 80    |

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|         |      | Training |            |      |            |       |
|---------|------|----------|------------|------|------------|-------|
| faculty |      | control  | assumption | goal | integrated | Total |
|         | ECON | 0        | 2          | 2    | 0          | 4     |
|         | POLI | 0        | 1          | 1    | 1          | 3     |
|         | ART  | 4        | 0          | 1    | 3          | 8     |
|         | PSYC | 2        | 0          | 0    | 2          | 4     |

---

|       |    |    |    |    |    |
|-------|----|----|----|----|----|
| GEOG  | 0  | 1  | 2  | 1  | 4  |
| BIOL  | 4  | 6  | 6  | 4  | 20 |
| CHEM  | 4  | 2  | 1  | 1  | 8  |
| ENGL  | 2  | 7  | 3  | 7  | 19 |
| SOCI  | 2  | 0  | 3  | 1  | 6  |
| ENGI  | 2  | 1  | 1  | 0  | 4  |
| Total | 20 | 20 | 20 | 20 | 80 |

### Apparatus - The Problems

We define insight problems as problems whose solution is likely to produce the experience of insight in the solver. We collected, adapted or invented eight problems that were potential insight problems. We created two different versions of problems, *puzzle-like* and *realistic*. In most cases both versions involved identical materials and differed only in the descriptive context, although in some the versions involved slightly different materials. The problems are described below together with a description of the underlying restructuring that may be required for solution—the characteristic which potentially makes each one an insight problem. Each problem may, of course, contain other elements that add to its difficulty. Also included are references to a problem’s previous use as an insight problem. The materials involved in each problem are described in Table 2. The corresponding instructions are described in Appendix B.

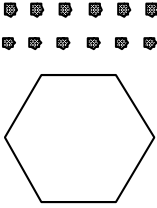
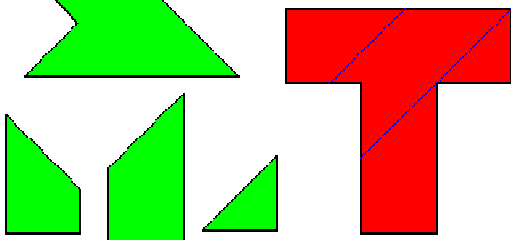
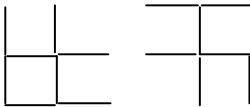
1. Problem 1 involves arranging 12 cards, 4 each of 3 types, into a grid so that each row and each column of the grid contains one and only one card of each type. The problem cannot be solved in a 3x3 or 4x3 arrangement, and requires expanding the boundaries of the table to a 4x4 grid by leaving gaps. The problem was created as an analog of Mendeleev’s insight in arranging the Periodic Table, to leave gaps for potentially missing elements (Kedrov, 1969). This is a new problem.

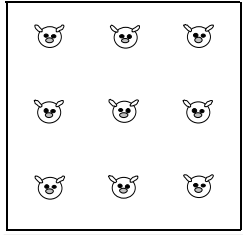
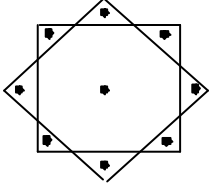
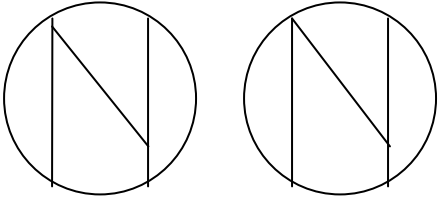

2. Problem 2 can be solved by placing one disc at each intersection and stacking a second disc on top. The solution therefore involves two forms of “double counting”, where a disc stacked on another disc is counted as being “on” an intersection, and an intersection is counted as being part of two edges. This is a new problem, although the stacking aspect of the solution requires using the third dimension, which is characteristic of a number of problems thought to involve insight (Metcalf and Weibe, 1987; Ormerod et al, 2002; Weisberg, 1992).
3. Problem 3 is a modification of the T puzzle (Suzuki, 2003). People persist in orienting the longest piece vertically or horizontally, while the solution requires that it be placed diagonally (Suzuki, 2003). Another potential barrier to solution is a tendency to want to fill the right-angled “notch” in the largest piece (Suzuki, 2003).
4. Problem 4 is a modification of the “fish” problem, where the source of difficulty is the unwarranted assumption that the original and solution states have to be vertically aligned (Kokinov et al, 1997).
5. Problem 5 is the “pigpen” problem described by Isaak and Just (1996) as an insight problem. The restructuring required for solution is that a square oriented as a diamond is still a square (Isaak and Just, 1996).
6. Problem 6 was inspired by the thought that, if bone fragments came from more than one animal, a paleontologist starting with the mind-set of a single animal would have a much more difficult task of reconstruction. In the version we used, the eight pieces of wood fit perfectly to make two separate circles, but cannot make a coherent single shape. As far as we know, this is a new problem.

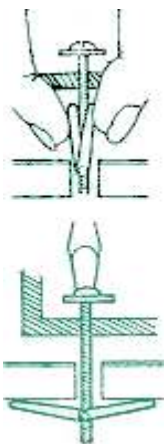
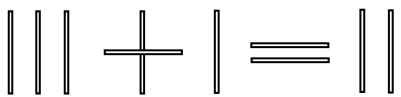
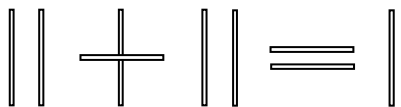
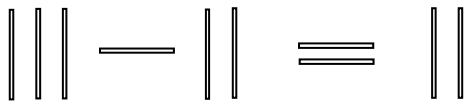
7. Problem 7 is new. It used a commercially-available hardware product (a wire clamp). To tighten the clamp a screw mechanism is attached and adjusted so that it *pushes* the two free ends of the clamp *apart*, whereas the natural tendency seems to be to try to tighten the clamp by *pulling* the free ends *together*.
8. Problem 8 is also new and similar to Problem 7 but operates in reverse. It uses a toggle bolt, where to tighten requires *pulling* the bolt *out* instead of pushing it in. The challenge is usually framed as ‘the hole is too big’ but the actual challenge is how to stabilize the nut and provide something for the bolt to screw into.
9. Problems 9, 10 and 11 are all ‘matchstick arithmetic problems’. These problems are mathematical and involve moving one stick to another position within the equation to make the equation true. The three problems each demanded a different level of ‘constraint relaxation’ (Isaak & Just, 1995; Knoblich & Haider, 1996; Knoblich & Oellinger, 2006; Knoblich, Ohlsson, Haider, & Rhenius, 1999; Knoblich & Wartenberg, 1998; Richard et al., 1993; Shultz & Lepper, 1996) in order to be solved.

Table 2  
*The Problems*

| Puzzle-like version                                                                                                                                                                                                                                                                                               | Realistic version                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Cards:<br/>Materials: Twelve cards from a standard deck, 4 Kings, Queens, Jacks</p> <p>Script: Here are 12 cards from a standard deck—the 4 Jacks, 4 Queens and 4 Kings. The task is to arrange them in a grid—a table—so that each row and each column contains only one Jack, one Queen and one King.</p> | <p>1. Materials: Twelve cards, 4 red, 4 blue, 4 white</p> <p>Script: A scientist believes that a complex molecule is made up of simpler molecules, represented here by 12 cards – 4 red, 4 white and 4 blue. The scientist also believes that they are arranged in a lattice or grid so that each row and each column contains a red, white and blue molecule. Can you arrange all of the cards in a table or grid so that each row and</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                | <p>each column has only one red, one white and one blue card?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p>2. Hexagon<br/>Diagram:</p>  <p>Script: Can you arrange the 12 discs so that each side of the hexagon has 4 discs?</p>                                                                                                                                                                                     | <p>2. Same as puzzle version</p> <p>Script: A molecule consist of 12 atoms (represented by the 12 discs,) arranged in a hexagon, so that each side has 4 atoms. How can this be done?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p>3. Cross<br/>Materials: Five pieces of wood that fit together to form a cross (as above T puzzle but middle section is broken into square and triangle with square on top of T to form cross):</p>  <p>Script: The task here is to arrange these 5 pieces of wood to form a cross (like a plus sign).</p> | <p>3. Same as puzzle version</p> <p>Script: When the practice of Christianity was outlawed under the Romans, believers held services in secret. A historian thinks that the cross used at such a service was specially constructed so that it could be quickly dismantled, and so that it would be difficult to see that the pieces go together to form a cross. She has found 5 pieces of well-preserved wood that she believes are the parts of such a cross. To confirm her hypothesis, she has to find how they fit together. These 5 pieces of wood are shaped like the ones she found. Can you arrange them to form a cross (like a plus sign)?</p> |
| <p>4. 8 Sticks<br/>Diagram:</p>  <p>Script: By moving three sticks only can you change the pattern on the left to look like the pattern on the right?</p>                                                                                                                                                   | <p>4. Same as puzzle version</p> <p>Script: The picture shows 8 sticks representing the chemical bonds believed to represent a basic chemical structure. Chemical theory requires that the pattern is able to change from looking like the structure on the left to looking</p>                                                                                                                                                                                                                                                                                                                                                                           |

|                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                   | <p>like the structure on the right by moving the positions of only three bonds (sticks). How is this possible?</p>                                                                                                                                                                                                            |
| <p>5. Pigs<br/>Diagram:</p>  <p>Script: Can you add two squares so that each of the 9 pigs/points ends up in a separate enclosure?</p>                                                                                                                                                                           | <p>5. Diagram (solution shown):</p>  <p>Script: The 9 points represent radioactive particles. Can you draw two squares (representing radioactive barriers) so that each particle is isolated from the effects of every other particle?</p> |
| <p>6. Plates</p>  <p>Materials:<br/>8 pieces of wood that fit to form two circles</p> <p>Script: Can you arrange these puzzle pieces of wood so that they fit together into what they once were?</p>                                                                                                            | <p>6. Materials: Same as puzzle version.</p> <p>Script: Archaeologists sometimes find fragments of ancient objects that they then have to try to reconstruct. Imagine that these eight pieces of wood represent pieces of broken pottery. Try to find a way to arrange them that shows what they were.</p>                    |
| <p>7. Clamp<br/>Materials: a round wire clamp that tightens by overlapping two ends and pushing the two ends apart with a screw configuration as opposed to 'cinching' or pulling the ends together, and a piece of black plastic 4 inch tubing</p>  <p>Script: The task you have before you asks that you</p> | <p>7. Materials: clamp and a 3 foot length of plastic 4 inch hosing</p> <p>Script: A vacuum repairman has replaced a hose to your vacuum and given you the pieces to assemble. You need to attach the hose to the black piece of plastic using this clamp. How will you do this?</p>                                          |

|                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| attach the clamp firmly around the plastic pipe.                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                    |
| <p>8. Screw<br/>Materials: toggle bolt, 18 x 4 x 4 wooden box, piece of metal to attach to the front of the box</p>  <p>Script: The task you have before you asks that you tighten the screw with a screwdriver so that the metal piece is firmly attached to the hollow beam. You cannot reach or look inside the beam.</p> | <p>8. Materials: same as for puzzle version except a basic lightbulb fixture was used instead of a piece of metal as the object needing to be attached to the box</p> <p>Script: An electrician must mount the light fixture to this hollow beam with a screwdriver and without being able to reach inside of the beam. How might one do this?</p> |
| <p>9. Matchstick problem #1</p>                                                                                                                                                                                                                                                                                            | <p>Answer: II + I = III</p>                                                                                                                                                                                                                                                                                                                        |
| <p>10. Matchstick problem #2</p>                                                                                                                                                                                                                                                                                           | <p>Answer III - II = I</p>                                                                                                                                                                                                                                                                                                                         |
| <p>11. Matchstick problem #3</p>                                                                                                                                                                                                                                                                                           | <p>Answer II = II = II</p>                                                                                                                                                                                                                                                                                                                         |

## Experiment 1 Design

The first experiment was a 4 x 2 design ( $N = 80$ ) evaluating the impact and interactions of 4 training conditions representing the independent variables and designed to manipulate attentional focus (control, assumption, goal, and integrated), as well as 2 problem conditions (puzzle problems and realistic problems) within 8 groups ( $n = 10$ ). The dependent variable was time to complete each problem and whether or not the problem was solved. Participants were randomly allocated to the various conditions.

## Experiment 1 Procedure

1. After informed consent was granted, the experimenter explained the experiment process (see Appendix B for complete training scripts).
2. Regardless of training condition, each participant received an introduction to the type of training they were to receive (see Appendix B for training scripts). Each training script was designed to be equal in length in order to ensure that each participant had the same amount of time and the same number of prompts during the problem analysis phase.
3. Regardless of training condition, each participant began with a practice problem called the 9-dot problem (see Table 2 for all problem descriptions and instructions).
4. A time limit of 4 minutes was imposed for each problem attempt. If the participant did not solve the problem within the time limit, then the experimenter would move on to the next problem. Participants were informed of the time limit prior to beginning the tasks and assured that the time limit was not designed to exert pressure but

rather to move the process along so as not to take any longer than an hour. It was also explained that 4 minutes represented enough time for a thorough attempt.

5. Participants then attempted to solve 11 insight problems (Table 2) accompanied by ‘reminder questions’ in accordance with their respective training conditions (see Appendix B for reminder questions). The reminder questions were asked at the 1 and 3 minute points.

6. The experimenter concluded by asking the participant two questions about the process (Appendix C). The first question asked about how helpful the process might be in enhancing one’s ability to solve similar problems in the future and was answered according to a Likert scale of 1-5 (strongly disagree to strongly agree). The second question asked how appealing were the different types of problems (pencil and paper, or manipulative) and was answered on a Likert scale of 1-5 (totally dislike to totally like).

7. Throughout the process, the experimenter noted the key responses to each of the questions posed within the intervention in order to gain qualitative data as well as a timed outcome for each problem.

### Experiment 1 Data Analysis

Because the sample was gender imbalanced, gender and problem solving were tested for correlation. To determine whether differences in outcome between conditions was significant, a one-way ANOVA with training (0.00 = Control, 1.00 = Assumption, 2.00 = Goal, and 3.00 = Integrated) and realism (0.00 = puzzle or 1.00 = realism) as the independent variables and problem solving (performance averaged across 11 problems) as a within-subjects dependent factor was conducted.

The second analysis aimed to separate out the realism factor and used performance on the three matchstick problems as the dependent variable (the proportion correct averaged across the three problems) and training as the independent variable (the realism factor wasn't relevant for the matchsticks). For training, 0.00 = Control, 1.00 = Assumption, 2.00 = Goal, and 3.00 = Integrated. The third analysis used performance averaged across eleven problems (3 matchsticks + 8 problems) as the dependent variable, and training as the independent variable (again, realism wasn't used, since matches had no "realistic" condition).

Significant differences were explored further using planned comparisons to determine significance levels between training groups on all eleven problems. Further exploration using one-way ANOVA was conducted to determine differences between problem clusters as well as individual problems. The nature of the problem clusters was determined using theoretical principles and supported by factor analysis (Table 3).

#### *Problem Cluster Rationale*

Problem 1 (hexagon): Initial constraint(s) (i) assumption that the discs must be arranged in two dimensions , and (ii) that they have to be placed on the sides as opposed to the intersections. The perception arises that there are *too few* discs which may become the barrier and the focus of the problem.

- The assumption is that the coins must be 'on the line'
- The barrier is that there are not enough coins
- The focus becomes on creating more coins, or spreading the coins out on the line more creatively

- The problem the barrier creates is that the coins must count for more
- The challenge becomes how to share the coins or double them up
- The solution is to stack them on the corners, fold the page, or make two coins share one point

Problem 2 (cards): Initial constraint - assumption that the grid or table be filled with cards, three per row and three per column, whereas for solution, the grid must be expanded. The perception arises that there are *too many* cards, which may become the barrier and the focus of the problem.

- The assumption is that the cards must form a symmetrical grid with no spaces, a box
- The barrier is that there are too many cards
- The focus becomes how to fit the cards into the grid
- The problem the barrier creates is that there isn't enough space for the cards
- The challenge becomes how to create space for the cards
- The solution is to spread the cards out and leave spaces in the grid

Problems 1 and 2 are alike in that their solution requires a restructuring of the dimensions of the problem space, in Problem 1, by expanding the boundaries in 2D and in Problem 2, by using 3D. It could also be argued that the hexagon and the cards share a similar insight. There are too many cards and too many sides, when really the solution lies in the perspective that there is not enough space and not enough coins.

Problem 3 (Sticks). Initial constraint--that the solution arrangement is aligned with the initial arrangement, so that the two outside edges of the closed square in the initial figure become the outside edges of the solution. Instead, the position of the solution arrangement is shifted one stick length lower than the starting arrangement. Solution therefore requires repositioning within the given/assumed problem space.

- The assumption is that the shape must be in the same position/placement on the page and therefore the upper right corner must be replicated
- The barrier is that to build the shape in this way requires too many sticks/moves
- The focus becomes how to build the shape in this way with fewer moves
- The problem the barrier creates is that the shape cannot be replicated in this upper corner
- The challenge becomes how to replicate the shape somewhere else
- The solution is to shift to the left or down and use another square as the base

Problem 4 (Pigs): Initial constraint—the assumption that the sides of a square are horizontal or vertical, not diagonal. The solution requires a square oriented as a diamond. Solution requires orienting one of the two squares on the diagonal.

- The assumption is that the squares must be drawn square to the page
- The barrier is not enough squares
- The focus becomes how to overlap the squares
- The problem the barrier creates is not enough enclosures
- The challenge becomes how to create more enclosures using only two squares

- The solution is to rotate one of the squares over top of the other

Problem 5 (Cross): Initial constraint(s)—(i) the longest piece should be placed horizontally or vertically, and (ii) the notch in the longest piece must be filled. Solution requires placing the piece diagonally, so that the “notch” becomes an interior corner. Solution therefore requires repositioning within the given/assumed problem space.

- The assumption is that the large piece must be a cross piece horizontally or vertically
- The barrier is the notch. If you square off the notch, there are not enough pieces to create a cross.
- The focus becomes how to fill the notch using fewer pieces
- The problem the barrier creates is that the notch cannot be squared off or that there are not enough pieces
- The challenge becomes how to make a square end in another way and how to make the large piece more integral
- The solution is to turn the large piece on an angle so that it forms part of both cross pieces

Problems 3, 4 and 5 are alike in that an initial constraint involves a wrong assumption about position/orientation within the implied 2 dimensions of the solution space, and solution requires a change in position/orientation. The sticks, pigs and cross are similar in that the real problem is how to create something (a base square, enclosures, squared ends) rather than figuring how to use the sticks, the squares, or the pieces of wood.

Problem 6 (plates): Initial constraint – assumption is that there must be one shape, whereas the solution requires that two shapes are created. The solution requires a shift in representation of the problem.

- The barrier is that the outside edges do not seem to fit together into a shape.
- The assumption is that all the pieces form one shape.
- The focus then becomes how to make the outside edges form some sort of shape.
- The problem the barrier creates is that the outside round edges aren't big enough and seem to create 'too small of an arc.'
- The challenge is to figure out what shape the outside edges represent.
- The solution is to allow the outside edges to dictate the shape(s) and two circles emerge.

Problem 7 (Clamp): Initial constraint—assumption that a clamp is tightened by pulling the free ends together, whereas the solution requires fixing the screw mechanism so that it pushes the free ends apart. The solution therefore requires a reversal of direction in one dimension.

- The assumption is that the clamp is tightened by bringing the two ends together or 'cinching' the ends
- The barrier is that the clamp is too big
- The focus becomes how to bring the two ends together using the pieces provided
- The problem the barrier creates is that the clamp needs to be made smaller somehow
- The challenge then becomes how to overlap the ends of the clamp
- The solution is to push the ends apart once they are overlapped using the screw

The plates would fit with the clamp because the actual problem is how to make the shape (the clamp or the circle) smaller rather than simply forming a preconceived shape. The solution involves attending to the emergent shape (of the tube the clamp must form itself around, and of the arc that the outer edges of the plates form).

Problem 8 (screw): Initial constraint—Assumption that the screw is tightened by turning it and pushing in, whereas it must be pulled out and held tight against the inner wall while screwing in. The solution requires a reversal of direction in one dimension.

- The assumption is that the screw must screw into the wood.
- The barrier is that the hole is too big.
- The focus then becomes how to make the hole smaller.
- The problem the barrier creates is that there is nothing for the screw to ‘grab.’
- The challenge is to find something else for the screw to ‘grab.’ The nut inside provides this alternative.
- However, a new barrier presents itself in that the screw just spins and the nut with it.
- The new challenge then becomes ‘how does one secure the nut?’
- The solution is to pull on the screw to secure the nut against the inner wall of the box.

The screw is unique because of the dual nature of its challenge. The first challenge is finding something else for the screw to grab, the second challenge is how to secure the nut.

Table 3  
*Rotated Component Matrix Insight Problems*

|          | Component |      |      |      |
|----------|-----------|------|------|------|
|          | 1         | 2    | 3    | 4    |
| Hexagon  | .852      |      |      |      |
| Cards    | .801      |      |      |      |
| 8 sticks |           | .720 |      |      |
| Pigs     |           | .635 |      |      |
| Cross    |           | .625 |      |      |
| Plates   |           |      | .845 |      |
| Clamp    |           |      | .664 |      |
| Screw    |           |      |      | .838 |

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 8 iterations.

As well, a one-way ANOVA was conducted to determine differences between training groups in terms of how ‘helpful’ participants perceived each intervention to be for solving insight problems.

Qualitative analysis involved deriving, coding and analyzing key themes emerging from each training / questioning process. Analysis was undertaken manually for initial theming along with two external researchers for inter-rater reliability. After the second level of analysis, the themes were checked with a group of three participants for further corroboration.

### Experiment 1 Results

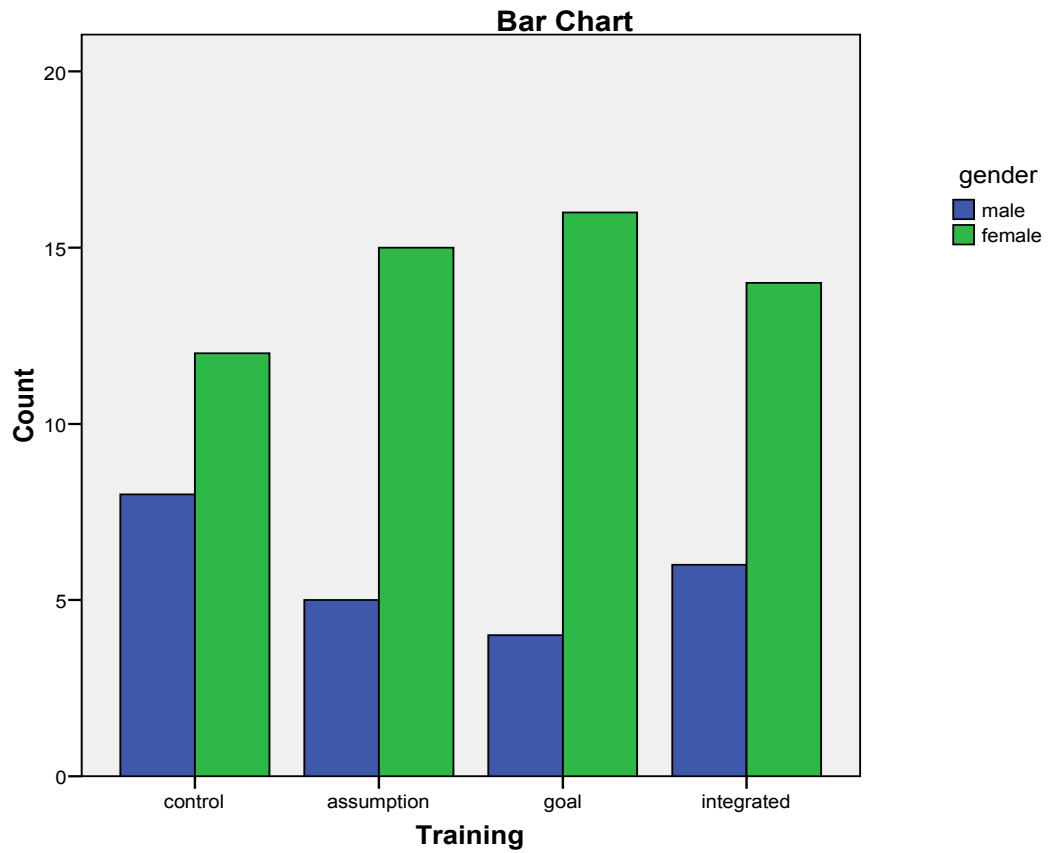
To address the gender inequality a test for correlation was run. Gender and problem solving proved to be significantly negatively correlated ( $r = -.294, p \leq .01$ ) suggesting that male participants were better problem solvers overall within this experiment. Because gender was approximately balanced across training groups (Figure 3), this correlation would not skew the overall results of the experiment, but may reduce the overall effect due to the limited number of male participants included.

Table 4  
*Gender / Problem Solving Correlation*

|        |                     | Gender    | Eleven    |
|--------|---------------------|-----------|-----------|
| Gender | Pearson Correlation | 1         | -.294(**) |
|        | Sig. (2-tailed)     |           | .008      |
|        | N                   | 80        | 80        |
| Eleven | Pearson Correlation | -.294(**) | 1         |
|        | Sig. (2-tailed)     | .008      |           |
|        | N                   | 80        | 80        |

\*\* Correlation is significant at the 0.01 level (2-tailed).

Figure 3  
*Gender Distribution Across Training Groups Experiment 1*



The first analysis used MANOVA to test the differences and interactions between two independent variables 1. training (.00 - control, 1.00-assumption, 2.00-goal, and 3.00-integrated) and 2. realism (.00 puzzle or 1.00 realistic type problems) and one

dependent variable of problem solving (performance averaged across problem clusters). The only significant result was with the cards/hexagons, where there was a significant interaction between type of training and realism and a significant effect of realism (Table 5). The graph (Figure 4) suggests that training had an effect with the puzzle versions, with the integrated focus being most effective, followed by the assumption training, but no effect with the realistic versions, where performance tended to be poorer on average than with the puzzle versions.

Table 5  
*MANOVA with Training and Realism as Independent Variables*

Descriptive Statistics

|          | Realism | Training | Mean  | Std. Deviation | N  |
|----------|---------|----------|-------|----------------|----|
| matches  | .00     | .00      | .5667 | .22498         | 10 |
|          |         | 1.00     | .5000 | .17568         | 10 |
|          |         | 2.00     | .3333 | .27217         | 10 |
|          |         | 3.00     | .6667 | .15713         | 10 |
|          |         | Total    | .5167 | .23811         | 40 |
|          | 1.00    | .00      | .4333 | .27442         | 10 |
|          |         | 1.00     | .5333 | .17213         | 10 |
|          |         | 2.00     | .4333 | .22498         | 10 |
|          |         | 3.00     | .5333 | .23307         | 10 |
|          |         | Total    | .4833 | .22583         | 40 |
| cardshex | .00     | .00      | .3000 | .42164         | 10 |
|          |         | 1.00     | .6500 | .47434         | 10 |
|          |         | 2.00     | .5000 | .47140         | 10 |
|          |         | 3.00     | .9000 | .21082         | 10 |
|          |         | Total    | .5875 | .45132         | 40 |
|          | 1.00    | .00      | .4000 | .51640         | 10 |
|          |         | 1.00     | .4000 | .31623         | 10 |
|          |         | 2.00     | .4000 | .39441         | 10 |
|          |         | 3.00     | .2000 | .34960         | 10 |
|          |         | Total    | .3500 | .39549         | 40 |

### Multivariate Tests (c)

| Effect             |                | Value | F        | Hypothesis df | Error df | Sig. | Partial Eta Squared |
|--------------------|----------------|-------|----------|---------------|----------|------|---------------------|
| m                  | Pillai's Trace | .143  | 2.272(a) | 5.000         | 68.000   | .057 | .143                |
| Training           | Pillai's Trace | .220  | 1.110    | 15.000        | 210.000  | .349 | .073                |
| Realism * training | Pillai's Trace | .229  | 1.159    | 15.000        | 210.000  | .306 | .076                |

a Exact statistic

b The statistic is an upper bound on F that yields a lower bound on the significance level.

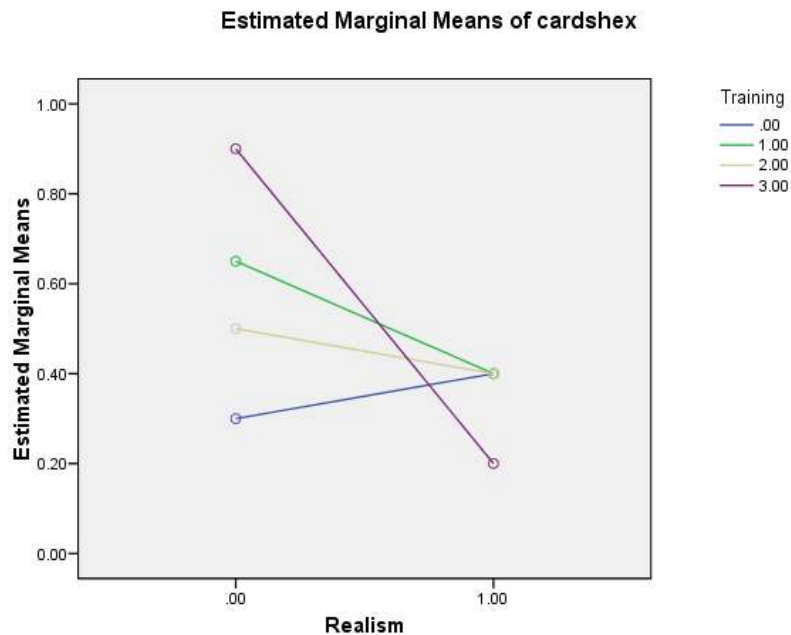
c Design: Intercept+Realism+Training+Realism \* Training

### Tests of Between-Subjects Effects

| Source  | Dependent Variable | Type III Sum of Squares | df | Mean Square | F     | Sig.  |
|---------|--------------------|-------------------------|----|-------------|-------|-------|
| Realism | matches            | .022                    | 1  | .022        | .456  | .502  |
|         | Eleven             | .087                    | 1  | .087        | 2.536 | .116  |
|         | plateclamp         | .113                    | 1  | .113        | .835  | .364  |
|         | stickpigcross      | .168                    | 1  | .168        | 1.527 | .221  |
|         | cardshex           | 1.128                   | 1  | 1.128       | 6.869 | .011* |
|         | screw              | .013                    | 1  | .013        | .052  | .820  |

Figure 4

*Estimated Marginal Means of Cards/Hex, Training and Realism*



The second analysis used performance on the three matchstick problems as dependent variable (the proportion correct averaged across the three problems) and training as the independent variable (the realism factor wasn't relevant for the matchsticks). For training, 0.00 = Control, 1.00 = Assumption, 2.00 = Goal, and 3.00 = Integrated. The final analysis used performance averaged across eleven problems (3 matchsticks + 8 problems) as dependent variable, and training as the independent variable (again, realism wasn't used, since matches had no "realistic" condition).

One-way ANOVA (Table 6) showed a significant overall effect of training on matchsticks,  $F(3,79) = 3.232, p = .027$ , and a marginally significant effect for the 11 problems combined  $F(3, 79) = 2.522, p = .064$ . Planned comparisons (Table 7) showed that the integrated training was significantly better than the goal focus in both matches and all eleven problems combined ( $p = .003$  and  $.010$  respectively).

Both assumption and integrated focus training showed a facilitative affect on problem solving outcome. Goal focus was the least effective, even compared to the control training in which participants were reminded of principles, approaches, and information that they may know but are simply not remembering at this time. It is hypothesized that a goal focus, though demonstrated to be a productive mindset in athletic endeavors, during insight problem solving a goal focus may involve the practice of attempting to replace negative images with corrective ones. Diverting attentional gaze in this way proved ineffective in studies on golfers at preventing a performance decline due to the attention required to suppress negative images (Beilock, Afremow, Rabe, & Carr, 2001). Blocking out, replacing, or averting attention from perceived threats to performance goals may have inhibited problem solving skills in the current experiment.

Table 6  
*One way ANOVA for Matches and All Eleven Problems Across Training Groups*

Descriptives

|         |       | N  | Mean  | Std. Deviation | Std. Error | 95% Confidence Interval for Mean |             | Minimum | Maximum |
|---------|-------|----|-------|----------------|------------|----------------------------------|-------------|---------|---------|
|         |       |    |       |                |            | Lower Bound                      | Upper Bound |         |         |
| matches | .00   | 20 | .5000 | .25363         | .05671     | .3813                            | .6187       | .00     | 1.00    |
|         | 1.00  | 20 | .5167 | .17014         | .03804     | .4370                            | .5963       | .33     | .67     |
|         | 2.00  | 20 | .3833 | .24839         | .05554     | .2671                            | .4996       | .00     | .67     |
|         | 3.00  | 20 | .6000 | .20520         | .04588     | .5040                            | .6960       | .00     | 1.00    |
|         | Total | 80 | .5000 | .23118         | .02585     | .4486                            | .5514       | .00     | 1.00    |
| Eleven  | .00   | 20 | .4773 | .17167         | .03839     | .3969                            | .5576       | .18     | .73     |
|         | 1.00  | 20 | .5227 | .14107         | .03154     | .4567                            | .5887       | .18     | .73     |
|         | 2.00  | 20 | .4182 | .22346         | .04997     | .3136                            | .5228       | .00     | .91     |
|         | 3.00  | 20 | .5773 | .21325         | .04768     | .4775                            | .6771       | .09     | 1.00    |
|         | Total | 80 | .4989 | .19567         | .02188     | .4553                            | .5424       | .00     | 1.00    |

ANOVA

|         |                | Sum of Squares | df | Mean Square | F     | Sig. |
|---------|----------------|----------------|----|-------------|-------|------|
| matches | Between Groups | .478           | 3  | .159        | 3.232 | .027 |
|         | Within Groups  | 3.744          | 76 | .049        |       |      |
|         | Total          | 4.222          | 79 |             |       |      |
| Eleven  | Between Groups | .274           | 3  | .091        | 2.522 | .064 |
|         | Within Groups  | 2.751          | 76 | .036        |       |      |
|         | Total          | 3.025          | 79 |             |       |      |

Table 7  
*Planned Comparison Tests for Training Groups*

Contrast Coefficients

| Contrast | Training |      |      |      |
|----------|----------|------|------|------|
|          | .00      | 1.00 | 2.00 | 3.00 |
| 1        | -1       | 0    | 0    | 1    |
| 2        | 0        | -1   | 0    | 1    |
| 3        | 0        | 0    | -1   | 1    |

Contrast Tests

|         |                        | Contrast | Value of Contrast | Std. Error | t     | df | Sig. (2-tailed) |
|---------|------------------------|----------|-------------------|------------|-------|----|-----------------|
| matches | Assume equal variances | 1        | .1000             | .07019     | 1.425 | 76 | .158            |
|         |                        | 2        | .0833             | .07019     | 1.187 | 76 | .239            |

|        |                        |   |       |        |       |    |       |
|--------|------------------------|---|-------|--------|-------|----|-------|
|        |                        | 3 | .2167 | .07019 | 3.087 | 76 | .003* |
| Eleven | Assume equal variances | 1 | .1000 | .06016 | 1.662 | 76 | .101  |
|        |                        | 2 | .0545 | .06016 | .907  | 76 | .367  |
|        |                        | 3 | .1591 | .06016 | 2.644 | 76 | .010* |

A one-way ANOVA was then applied to problem clusters. The problem clusters were arranged based on theoretical principles (Table 3) and supported by a factor analysis. A one-way ANOVA (Table 8) was run to further explore differences between training groups on problem solving in terms of problem clusters and individual problems. Planned comparison tests were also run to distinguish differences between training groups.

Table 8  
*ANOVA for Individual Problems and Problem Clusters*

|               | Sum of Squares | df | Mean Square | F     | Sig. |
|---------------|----------------|----|-------------|-------|------|
| match 1       | 1.338          | 3  | .446        | 2.812 | .045 |
| match 2       | .638           | 3  | .213        | .905  | .443 |
| match 3       | .050           | 3  | .017        | .230  | .875 |
| cards         | .850           | 3  | .283        | 1.152 | .334 |
| plates        | .500           | 3  | .167        | .777  | .510 |
| sticks        | .238           | 3  | .079        | .305  | .822 |
| pigs          | .438           | 3  | .146        | .576  | .633 |
| cross         | .038           | 3  | .013        | .058  | .981 |
| hex           | .338           | 3  | .113        | .435  | .728 |
| screw         | .538           | 3  | .179        | .759  | .521 |
| clamp         | 1.650          | 3  | .550        | 2.444 | .070 |
| cardshex      | .484           | 3  | .161        | .835  | .479 |
| stickpigcross | .115           | 3  | .038        | .358  | .784 |
| plateclamp    | .738           | 3  | .246        | 1.841 | .147 |

Table 9  
*Contrast Tests for Problem Clusters and Individual Problems*

| Contrast |  | Training |      |      |      |
|----------|--|----------|------|------|------|
|          |  | .00      | 1.00 | 2.00 | 3.00 |
| 1        |  | -1       | 0    | 0    | 1    |
| 2        |  | 0        | -1   | 0    | 1    |
| 3        |  | 0        | 0    | -1   | 1    |

|                |                        | Contrast | Value of Contrast | Std. Error | t     | df | Sig. (2-tailed) |
|----------------|------------------------|----------|-------------------|------------|-------|----|-----------------|
| matches        | Assume equal variances | 1        | .1000             | .07019     | 1.425 | 76 | .158            |
|                |                        | 2        | .0833             | .07019     | 1.187 | 76 | .239            |
|                |                        | 3        | .2167             | .07019     | 3.087 | 76 | .003*           |
| cardshex       | Assume equal variances | 1        | .2000             | .13902     | 1.439 | 76 | .154            |
|                |                        | 2        | .0250             | .13902     | .180  | 76 | .858            |
|                |                        | 3        | .1000             | .13902     | .719  | 76 | .474            |
| stickpigcross  | Assume equal variances | 1        | .0833             | .10363     | .804  | 76 | .424            |
|                |                        | 2        | .0667             | .10363     | .643  | 76 | .522            |
|                |                        | 3        | .1000             | .10363     | .965  | 76 | .338            |
| coinclampscrew | Assume equal variances | 1        | .0500             | .09745     | .513  | 76 | .609            |
|                |                        | 2        | .0333             | .09745     | .342  | 76 | .733            |
|                |                        | 3        | .2000             | .09745     | 2.052 | 76 | .044            |
| coinclamp      | Assume equal variances | 1        | .0000             | .11556     | .000  | 76 | 1.000           |
|                |                        | 2        | -.0500            | .11556     | -.433 | 76 | .666            |
|                |                        | 3        | .2000             | .11556     | 1.731 | 76 | .088            |

Finally, a one-way ANOVA was run to determine the degree to which participants found the various training interventions to be ‘helpful’ (Likert scale 1-5) in solving insight problems. Results demonstrate that there was no significant difference in perceived helpfulness between training groups despite the significant differences in outcome (control  $m = 3.6842$   $SE = .10956$ , assumption  $m = 3.9167$   $SE = .16295$ , goal  $m = 3.9167$   $SE = .12942$ , integrated focus  $m = 3.9211$   $SE = .10305$ ).

Table 10  
*Helpfulness of Training Experiment 1*

Descriptives

|         |       | N  | Mean   | Std. Deviation | Std. Error | 95% Confidence Interval for Mean |             | Minimum | Maximum |
|---------|-------|----|--------|----------------|------------|----------------------------------|-------------|---------|---------|
|         |       |    |        |                |            | Lower Bound                      | Upper Bound |         |         |
| helpful | .00   | 19 | 3.6842 | .47757         | .10956     | 3.4540                           | 3.9144      | 2.50    | 4.00    |
|         | 1.00  | 18 | 3.9167 | .69133         | .16295     | 3.5729                           | 4.2605      | 3.00    | 5.00    |
|         | 2.00  | 18 | 3.9167 | .54906         | .12942     | 3.6436                           | 4.1897      | 3.00    | 5.00    |
|         | 3.00  | 19 | 3.9211 | .44917         | .10305     | 3.7046                           | 4.1375      | 3.00    | 5.00    |
|         | Total | 74 | 3.8581 | .54597         | .06347     | 3.7316                           | 3.9846      | 2.50    | 5.00    |

Qualitative data was themed and coded (Appendix F). Key themes emerging from the qualitative data included solution readiness and problem strategies, individual problem solving styles, and helpfulness of the intervention.

Readiness to see solutions included factors such as:

1. Gets solution but not problem (i.e. diagonal cards, had spaces, but then went back to box)
2. Intuitive (i.e. filled angle, kept picture in mind, lucky/random)
3. Sees failure and solution (i.e. can't move it' 'how do you not move one?' 'reverse to make 2nd one look like 1st?')
4. Sees problem and solution (i.e. obviously I'll have to leave blank spaces, always comes down to this one card)
5. Sees problem but cannot get solution (i.e. the problem is too many cards, how can I make them all fit? The other problem is that I can't see it any other way)

Strategies were also represented by individuals across problems and captured within individual problem solving styles. These included:

1. Barrier focused, tries harder (i.e. counted them, stacked them in middle in order to 'make them fit' into the side)
2. Explorative, open, loose, willing to take risks, tolerant of failure ( i.e. fiddled, turned on angle, drew it separate, got a bit stuck, then saw it)
3. Constrained by assumptions (i.e. like sudoku, 3 extras, held them in his hand, 'rows and columns', moved some 'out' of box, I know I'm assuming it has to be a square....)
4. Reluctant to take risks (i.e. Sudoku, NO! can't do it, left 3 cards in hands, left cards in piles)
5. Insightful, sees root of problem (i.e. what's the same? Obviously want to move 4, that's the barrier, why can't I make it down here? Why not here? Saw it immediately  $4 \times 6 = 24$ , that is convenient, obviously need to share, 3 a side, why can't I stack?)
6. Intuitive, instinctively approaches problem (i.e. closed eyes, covered sticks at bottom, 'oh! That is what I am assuming!')

Participants found each of the interventions helpful and were able to articulate well the means by which each training intervention was intended to facilitate problem solving:

1. Control: helpful, but the questions frustrated me, made me go where I didn't want to go...
2. Assumption: reminded of assumptions, think of diff alternatives, shown answer and see new possibilities
3. Goal: reminds of goal, otherwise spend useless time, important in science
4. Integrated: try things but then ask why is this a problem? 'use block to move to a new way of thinking instead of just throwing away the blocked attempt'

However, the subjective attribution of helpfulness was similar across groups despite comments to the contrary. Participants generally found any intervention helped them to ‘think outside the box.’

### Experiment 1 Discussion

While gender showed a negative correlation with problem solving outcome suggesting that the more female participants the less of an impact the intervention would have upon problem solving outcome, balancing out the gender distribution by increasing the number of male participants would only serve to increase the significance of the overall outcome of the intervention upon problem solving outcome since the intervention showed a positive effect.

Realism was not as much of a factor as was anticipated. Though it is hypothesized that a ‘realistic context’ may enhance problem solving capability (Boyatzis & Kolb, 1991; Kolb, 1984; Zull, 2004) it has also been argued that ‘context’ can work either way to enhance or detract from problem solving outcome (Johns, 2006) and may inhibit problem solving processes (Wiley, 1998). It would seem that the ‘realism’ created within this study may have been more of a ‘false context’ working alongside countervailing factors such as both training and type of problem to both enhance (cards/hex problems) and inhibit (other problems) the problem solving process. Results from the study suggest that the most appropriate avenue to test for the application of the intervention within a realistic setting would be a field setting.

The qualitative data emphasized that it was not enough to simply ‘see the problem’ nor was it enough to simply ‘see past the impasse or solution.’ The problem solving process seemed to involve a combination of factors including problem

representation and solution readiness. One must also be ready to see the solution when it presents itself, or ready to see the problem for what it is and generate appropriate solutions as opposed to relying upon tried and true strategies. As well, checking assumptions is important but not always realistic. As several participants queried: ‘how can I check my assumptions when I don’t realize I am making them?’ The data suggests that those who are truly insightful were able to work through the problem and identify its core. For instance, the screw problem is not that the hole is too big, but that one must fix the nut inside somehow in order for the screw to catch and tighten. Participants who were able to see the problem for what it was, as well as let go of barrier focused strategies were the most successful or insightful.

As discussed earlier, it may be difficult to change beliefs and attitudes formed over a lifetime. It is suggested in the present study that leverage for effective problem solving as it affects performance may be found in an enlargement or integration of attentional focus. In the area of transformational learning, the concept of a perspective transformation arises reflecting a similar theoretical framework as the attentional focus integration suggested here. Perspective transformation as it is understood in the transformational learning literature involves:

a) a disorienting dilemma or problem (Ferguson, 1980; Skar, 2004; Loder, 1981; Wildemeersch & Lierman, 1988; Busick, 1989; Mezirow, 1991) causing

b) a threatening and challenging opportunity for reflection, problem solving and expansion of consciousness (Bailey, 1996, Duff 1989, Ferguson 1980, Goodson 1977, Loder, 1981; Mezirow, 1991; Neuman, 1996; Pierce, 1986; Watson, 1989) at which point the individual must make

c) a deliberate choice to confront the conflict or dilemma (Busick, 1989; Newman, 1994; Ferguson, 1980; Smith, 1984; Wildemeersch & Lierman, 1988) by

d) the questioning of assumptions (Hagberg, 2002; Kegan, 2000; Mezirow, 1991; Schein, 1999; Walker, 2000),

e) the releasing of old ways of knowing, becoming receptive to new ways of viewing the self, and reinterpreting experiences in a new context (Loder, 1981; Mezirow, 1991) resulting in

f) a new level of consciousness or insight which unites the mind and heart to form a new self-definition (Ferguson, 1980; Mezirow, 1991) and express a more inclusive, differentiated, permeable and integrated meaning perspective (Dirkx, 2000; Loder, 1981; Busick, 1989; Mezirow, 1991).

These themes reflect the concept of ‘failure or impasse’ described in the current study, ‘questioning of assumptions’ and some form of release or ‘letting go’ of a barrier focus. Mezirow and his associates (1978, 1981, 1991, 1994, 1995, 1996, 2000) devised 10 phases of perspective transformation from their theory of transformative learning, known as transformational learning theory (TLT). This theory explains how adults interpret life experiences, make meaning, and change a belief, an attitude, or an entire perspective. A change in perspective is personally emancipating in that one is freed from previously held beliefs, attitudes, values, and feelings that have constricted and distorted one's life. Significant and long-lasting growth in adult learners, sometimes called perspective transformation, is fundamental to transformative learning. “Perspective transformation is the process of becoming critically aware of how and why our assumptions have come to constrain the way we perceive, understand, and feel about our

world; changing these structures of habitual expectation to make possible a more inclusive, discriminating, and integrating perspective; and, finally, making choices or otherwise acting upon these new understandings” (Cranton, 1994, p. 22). Critical to Cranton’s insight and different from Mezirow’s approach is the idea that a transformation in perspective, not beliefs necessarily, is the pivotal point for making possible a more inclusive, discriminating and integrative insight into challenges we face.

Transformation theory describes the process by which we acquire a greater degree of insight and agency as adult learners by highlighting the understandings, skills and dispositions involved and the conditions under which transformative learning is facilitated or precipitated. Mezirow’s idea of shifting frames of reference is reminiscent of Kuhn’s notion of a paradigm, the transformation of frames of reference act much like a paradigm shift (1962-1996). Transformative learning unlike ‘critical reflection’, implies that a fundamental reordering (or shift) in assumptions (frame or reference) takes place. Centrality of experience, critical reflection, and rational discourse are three common themes in Mezirow’s theory (Taylor 1998), which is based on psychoanalytic theory (Boyd and Myers 1988) and critical social theory (Scott 1997).

For learners to change their “meaning schemes (specific beliefs, attitudes, and emotional reactions),” they must engage in critical reflection on their experiences, which in turn leads to a perspective transformation (Mezirow 1991, p. 167). Meaning schemes are based upon experiences that can be deconstructed and acted upon in a rational way (Taylor 1998). Mezirow (1995) suggests this happens through a series of phases that begin with the disorienting dilemma. Other phases include self-examination, critical assessment of assumptions, recognition that others have shared similar transformations,

exploration of new roles or actions, development of a plan for action, acquisition of knowledge and skills for implementing the plan, tryout of the plan, development of competence and self-confidence in new roles, and reintegration into life on the basis of new perspectives (p. 50). The meaning schemes that make up meaning structures may change as an individual adds to or integrates ideas within an existing scheme and, in fact, this transformation of meaning schemes occurs routinely through learning. Perspective transformation leading to transformative learning, however, occurs much less frequently. Mezirow believes that it usually results from a “disorienting dilemma,” which is triggered by a life crisis or major life transition, although it may also result from an accumulation of transformations in meaning schemes over a period of time (p. 50).

As described by Mezirow (1997), transformative learning occurs when individuals change their frames of reference by critically reflecting on their assumptions and beliefs and consciously making and implementing plans that bring about new ways of defining their worlds. His theory describes a learning process that is primarily "rational, analytical, and cognitive" with an "inherent logic" (Grabov 1997, pp. 90-91). Critical responses to Mezirow's theory of transformative learning have emerged over the years (see Cranton, 1994 and Taylor, 1998 for a full discussion of these critiques). Mezirow's emphasis upon rationality provoked one area of contention. Although many empirical studies support Mezirow's assertion that critical reflection is central to transformative learning, others have “concluded that critical reflection is granted too much importance in a perspective transformation, a process too rationally driven” (Taylor 1998, pp. 33-34). Grabov (1997) and Boyd (Boyd and Myers 1988) view transformative learning as an “intuitive, creative, emotional process” (Grabov 1997, p. 90). Boyd has developed a

theory of transformative education based on analytical (or depth) psychology. Unlike Mezirow, who sees the ego as playing a central role in the process of perspective transformation, Boyd and Myers use a framework that moves beyond the ego and the emphasis on reason and logic to a definition of transformative learning that is more psychosocial in nature (Taylor, 1998).

The concept of ‘questioning assumptions’ raises Kegan’s concept of ‘subject-object’ configuration known as ‘third order knowing’. Kegan suggests that we are ‘subject’ to the experiences by which we are run, whereas we take as ‘object’ the experiences we are aware of. Fourth order knowing allows for an examination of the abstractions that have been guiding actions unaware and the larger systems and inquiry processes from which the abstractions have been generated. In addition, the values and commitments of the communities to which one belongs come into view and can be examined and critiqued (Hooper, 2006). Kegan and colleagues call the process of fourth order knowing ‘questioning the big assumptions.’

Failure to sustain the initial resolve to change can be misinterpreted as a lack of commitment to one's original goals and eventually lead to greater effort expended in rationalizing the status quo rather than changing it. Kegan’s ‘questioning the big assumptions’ was successfully used in an international faculty development program for medical educators to enhance individual personal satisfaction and professional effectiveness (Bowe, Lahey, Armstrong & Kegan, 2003). This process systematically encouraged participants to explore and proactively address currently operative mechanisms that could stall their attempts to change at the professional level. The applications of the Big Assumptions process in faculty development helped individuals to

recognize and subsequently utilize unchallenged and deep rooted personal beliefs to overcome unconscious resistance to change. This approach systematically led participants away from circular griping about what was not right in their current situation to identifying the actions that they needed to take to realize their individual goals. By thoughtful testing of personal Big Assumptions, participants designed behavioural changes that could be broadly supported and, most importantly, sustained.

A major problem with Kegan's model is that it can only be fully comprehended and used by those at the higher stage, which is a small minority of the population. Comprehending the interview process is also very complex and time consuming, so it has not become popular. However, the model does lend insight into how people might be 'moved' from one stage to the next, through one 'insight' to the next and may provide theoretical explanation for the positive results for the assumption focus training in the current study.

## CHAPTER 5 EXPERIMENT 2

### Introduction

Experiment 2 involved the delivery of a more complex intervention than was utilized in experiment 1 based upon a series of questions designed to manipulate participant focus on several problem solving tasks. Conditions included integrated focus and control focus. Problem type was not manipulated.

### Experiment 2 Participants

The participants were 40 students (26 female, 14 male) deriving from a variety of departments within one university who volunteered to take part in the experiment in response to email and poster requests. Participants were given \$20.00 to participate and provided signed informed consent (Appendix A) prior to partaking in the experiment. Participation was restricted to English speakers due to the complexity of the task instructions. Descriptive statistics follow (Figure 5, Table 11).

Table 11  
*Experiment 2 Sample Distributions for Gender and Faculty According to Training Group*

|        |          | Condition |          | Total   |
|--------|----------|-----------|----------|---------|
|        |          | control   | training | control |
| Gender | 1.00 -M  | 7         | 4        | 11      |
|        | 2.00 - F | 13        | 16       | 29      |
| Total  |          | 20        | 20       | 40      |

| Faculty |      | Condition |          | Total   |
|---------|------|-----------|----------|---------|
|         |      | control   | training | control |
| 1.00    | ECON | 2         | 0        | 2       |
| 2.00    | POLI | 3         | 4        | 7       |
| 3.00    | ART  | 1         | 4        | 5       |

|       |      |    |    |    |
|-------|------|----|----|----|
| 4.00  | PSYC | 5  | 2  | 7  |
| 5.00  | GEOG | 3  | 3  | 6  |
| 6.00  | BIOL | 1  | 2  | 3  |
| 7.00  | CHEM | 1  | 1  | 2  |
| 8.00  | ENGL | 1  | 0  | 1  |
| 9.00  | SOCI | 2  | 1  | 3  |
| 10.00 | ANTH | 1  | 3  | 4  |
| Total |      | 20 | 20 | 40 |

### Experiment 2 Apparatus

The problems utilized in Experiment 2 were the same as in Experiment 1 (see Table 2).

### Experiment 2 Design

The second experiment used one-way analysis of variance ( $N = 40$ ) to evaluate the impact and interactions of 2 training conditions representing the independent variables (control and integrated) and designed to manipulate attentional focus between 2 groups ( $n = 20$ ). The dependent variable was time to solve each problem. Participants were randomly allocated to the two training conditions.

### Experiment 2 Procedure

1. After informed consent was granted, the experimenter explained the experiment process (see Appendix B for complete scripts).
2. Regardless of training condition, each participant received an introduction to the type of training they were to receive (see Appendix D for experiment 2 training scripts).
3. Regardless of training condition, each participant began with a practice problem called the 9-dot problem.
4. The order of the problems was, for this experiment, randomized.

5. A time limit of 4 minutes was imposed for each problem attempt. If the participant did not solve the problem within the time limit, then the experimenter would move on to the next problem. Participants were informed of the time limit prior to beginning the tasks and assured that the time limit was not designed to exert pressure but rather to move the process along so as not to take any longer than an hour. It was also explained that 4 minutes represented enough time for a thorough attempt.

6. Participants then attempted to solve 11 insight problems of the puzzle type only (see Table 2 for all problem descriptions and instructions) accompanied by an insight training script in accordance with their respective training conditions (see Appendix D for experiment 2 training scripts – integrated and control conditions). The training script was begun at the 1 minute point for all conditions.

7. The experimenter concluded by asking the participant two questions about the process (Appendix C). The first question asked about how helpful the process might be in enhancing one's ability to solve similar problems in the future and was answered according to a Likert scale of 1-5 (strongly disagree to strongly agree). The second question asked how appealing were the different types of problems (pencil and paper, or manipulative) and was answered on a Likert scale of 1-5 (totally dislike to totally like).

8. Throughout the process, the experimenter noted the key responses to each of the questions posed within the intervention in order to gain qualitative data as well as a timed outcome for each problem.

## Experiment 2 Data Analysis

Because gender showed a correlation with problem solving in the previous experiment, and because the sample was again gender imbalanced for experiment 2, gender and outcome were tested for correlation.

To determine whether differences in outcome (performance averaged across all eleven problems) between conditions was significant, a one-way ANOVA with training (integrated and control) conditions as between-subjects factors, and problem (1-11) as a within-subjects factor was conducted. To further explore differences, ANOVA's were conducted on problem clusters and chi square tests run on individual problems.

Qualitative analysis involved deriving, coding and analyzing key themes emerging from each training / questioning process. Analysis was undertaken manually for initial theming along with two external researchers for inter-rater reliability. After the second level of analysis, the themes were checked with a group of three participants for further corroboration.

## Experiment 2 Results

Because gender showed a correlation with problem solving in the previous experiment, and because the sample was again gender imbalanced for experiment 2, gender and outcome were tested for correlation (Table 12). No significant correlation emerged between gender and problem solving performance in this experiment,  $r = -.081$ ,  $p = .618$  ( $p \leq .05$ ).

Table 12  
*Test for Correlation Between Gender and Problem Solving*

|                            |                     |        |
|----------------------------|---------------------|--------|
| Gender and all 11 problems | Pearson Correlation | -0.081 |
|                            | Sig. (2-tailed)     | .618   |
|                            | N                   | 40     |

$p \leq .05$

To determine whether differences in outcome (performance averaged across all eleven problems) between conditions was significant, a one-way ANOVA with training (integrated and control) conditions as between-subjects factors, and problem (1-11) as a within-subjects factor was conducted (Table 13). One-way ANOVA showed a significant overall effect of integrated focus training compared to the control training group for the 11 problems combined [ $F(1, 38) = 12.481, p < .001$ ]. The more detailed integrated focus intervention showed a greater overall effect compared to the control training intervention than in experiment 1 (22% difference in experiment 2 as compared with 10% difference in experiment 1).

Table 13  
*One way ANOVA for Control and Training Groups Across All Eleven Problems*

Descriptives

|          | N  | Mean  | Std. Deviation | Std. Error | 95% Confidence Interval for Mean |             | Minimum | Maximum |
|----------|----|-------|----------------|------------|----------------------------------|-------------|---------|---------|
|          |    |       |                |            | Lower Bound                      | Upper Bound |         |         |
| control  | 20 | .4955 | .20535         | .04592     | .3993                            | .5916       | .09     | 1.00    |
| training | 20 | .7182 | .19319         | .04320     | .6278                            | .8086       | .27     | 1.00    |
| Total    | 40 | .6068 | .22682         | .03586     | .5343                            | .6794       | .09     | 1.00    |

$p \leq .05$

ANOVA for All Eleven Problems ( $p \leq .05$ )

|                | Sum of Squares | df | Mean Square | F    | Sig.  |
|----------------|----------------|----|-------------|------|-------|
| Between Groups | .496           | 1  | .496        | .481 | .001* |

One-way ANOVA for problem clusters (Table 14) showed a significant effect for the screw ( $F(1,38) = 12.667, p = 0.001$ ) and cards/hex ( $F(1,38) = 8.061, p = 0.007$ ) clusters, and a marginally significant effect for the matches ( $F(1, 38) = 3.378, p = 0.074$ ) and sticks/pigs/cross ( $F(1, 38) = 3.252, p = 0.079$ ) clusters. However, for the plate/clamp combination there was no significant effect ( $F(1,38) = 1.754, p = 0.193$ ). Descriptive statistics for individual problems show a trend in that the integrated focus training shows a positive effect in terms of mean outcome in comparison with the control intervention across problems. Mean differences between training groups for individual problems ranged from 0 - 35% difference.

Table 14  
ANOVA for Problem Clusters ( $p \leq .05$ )

|                      |                | Sum of Squares | df | Mean Square | F     | Sig. |
|----------------------|----------------|----------------|----|-------------|-------|------|
| matches              | Between Groups | .178           | 1  | .178        | 3.378 | .074 |
| cardshex             | Between Groups | 1.225          | 1  | 1.225       | 8.061 | .007 |
| stickspigscros       | Between Groups | .336           | 1  | .336        | 3.252 | .079 |
| platesscrew<br>clamp | Between Groups | .225           | 1  | .225        | 1.754 | .013 |

Pearson Chi Square tests (Table 15,  $p \leq .05$ ) for individual problems across training groups resulted in significant results for the cards ( $p = 0.024$ ), hexagon ( $p = 0.024$ ), screw ( $p = 0.002$ ) and 8 sticks ( $p = 0.041$ ) problems, with marginally significant results for the matches 3 problem ( $p = .095$ ).

Table 15  
*Descriptive Statistics for Individual Problems Between Groups*

|          |          | N  | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean |             | Minimum | Maximum |
|----------|----------|----|------|----------------|------------|----------------------------------|-------------|---------|---------|
|          |          |    |      |                |            | Lower Bound                      | Upper Bound |         |         |
| match 1  | control  | 20 | .80  | .410           | .092       | .61                              | .99         | 0       | 1       |
|          | training | 20 | .95  | .224           | .050       | .85                              | 1.05        | 0       | 1       |
|          | Total    | 40 | .88  | .335           | .053       | .77                              | .98         | 0       | 1       |
| match 2  | control  | 20 | .85  | .366           | .082       | .68                              | 1.02        | 0       | 1       |
|          | training | 20 | .85  | .366           | .082       | .68                              | 1.02        | 0       | 1       |
|          | Total    | 40 | .85  | .362           | .057       | .73                              | .97         | 0       | 1       |
| match 3  | control  | 20 | .25  | .444           | .099       | .04                              | .46         | 0       | 1       |
|          | training | 20 | .50  | .513           | .115       | .26                              | .74         | 0       | 1       |
|          | Total    | 40 | .38  | .490           | .078       | .22                              | .53         | 0       | 1       |
| cards    | control  | 20 | .20  | .410           | .092       | .01                              | .39         | 0       | 1       |
|          | training | 20 | .55  | .510           | .114       | .31                              | .79         | 0       | 1       |
|          | Total    | 40 | .38  | .490           | .078       | .22                              | .53         | 0       | 1       |
| plates   | control  | 20 | .70  | .470           | .105       | .48                              | .92         | 0       | 1       |
|          | training | 20 | .80  | .410           | .092       | .61                              | .99         | 0       | 1       |
|          | Total    | 40 | .75  | .439           | .069       | .61                              | .89         | 0       | 1       |
| 8 sticks | control  | 20 | .55  | .510           | .114       | .31                              | .79         | 0       | 1       |
|          | training | 20 | .85  | .366           | .082       | .68                              | 1.02        | 0       | 1       |
|          | Total    | 40 | .70  | .464           | .073       | .55                              | .85         | 0       | 1       |
| pigs     | control  | 20 | .65  | .489           | .109       | .42                              | .88         | 0       | 1       |
|          | training | 20 | .75  | .444           | .099       | .54                              | .96         | 0       | 1       |
|          | Total    | 40 | .70  | .464           | .073       | .55                              | .85         | 0       | 1       |
| cross    | control  | 20 | .40  | .503           | .112       | .16                              | .64         | 0       | 1       |
|          | training | 20 | .55  | .510           | .114       | .31                              | .79         | 0       | 1       |
|          | Total    | 40 | .48  | .506           | .080       | .31                              | .64         | 0       | 1       |
| hexagon  | control  | 20 | .45  | .510           | .114       | .21                              | .69         | 0       | 1       |
|          | training | 20 | .80  | .410           | .092       | .61                              | .99         | 0       | 1       |
|          | Total    | 40 | .63  | .490           | .078       | .47                              | .78         | 0       | 1       |
| screw    | control  | 20 | .25  | .444           | .099       | .04                              | .46         | 0       | 1       |
|          | training | 20 | .75  | .444           | .099       | .54                              | .96         | 0       | 1       |
|          | Total    | 40 | .50  | .506           | .080       | .34                              | .66         | 0       | 1       |
| clamp    | control  | 20 | .35  | .489           | .109       | .12                              | .58         | 0       | 1       |
|          | training | 20 | .55  | .510           | .114       | .31                              | .79         | 0       | 1       |
|          | Total    | 40 | .45  | .504           | .080       | .29                              | .61         | 0       | 1       |

Table 16  
*Chi Square Tests for Individual Problems Between Groups ( $p \leq .05$ )*

| Problem   | Value     | df | Exact Sig. (1-sided) |
|-----------|-----------|----|----------------------|
| Matches 1 | 2.057(b)  | 1  | .171                 |
| Matches 2 | .000(b)   | 1  | .669                 |
| Matches 3 | 2.667(b)  | 1  | .095                 |
| Cards     | 5.227(b)  | 1  | .024*                |
| Plates    | .533(b)   | 1  | .358                 |
| Sticks    | 4.286(b)  | 1  | .041*                |
| Pigs      | .476(b)   | 1  | .366                 |
| Cross     | .902(b)   | 1  | .264                 |
| Hexagon   | 5.227(b)  | 1  | .024*                |
| Screw     | 10.000(b) | 1  | .002*                |
| Clamp     | 1.616(b)  | 1  | .170                 |

Finally, a one-way ANOVA was run to determine the degree to which participants found the various training interventions to be ‘helpful’ (Likert scale 1-5) in solving insight problems (Table 17). Results demonstrate that there was no significant difference in perceived helpfulness between training groups despite the significant differences in outcome ( $F(1, 38) .029, p = .866$ , control  $m = 4.03$   $SE = .117$ , integrated training  $m = 4.05$   $SE = .088$ ). The ANOVA comparing mean differences in attributed helpfulness between the control and training interventions was non-significant (control  $m = 4.03$  and integrated  $m = 4.05, p = .866$ ).

Table 17  
ANOVA Helpfulness Experiment 2

Descriptives

|         |          | N  | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean |             | Minimum | Maximum |
|---------|----------|----|------|----------------|------------|----------------------------------|-------------|---------|---------|
|         |          |    |      |                |            | Upper Bound                      | Lower Bound |         |         |
| helpful | control  | 20 | 4.03 | .525           | .117       | 3.78                             | 4.27        | 3       | 5       |
|         | training | 20 | 4.05 | .394           | .088       | 3.87                             | 4.23        | 3       | 5       |
|         | Total    | 40 | 4.04 | .458           | .072       | 3.89                             | 4.18        | 3       | 5       |

ANOVA

|         |                | Sum of Squares | df | Mean Square | F    | Sig. |
|---------|----------------|----------------|----|-------------|------|------|
| helpful | Between Groups | .006           | 1  | .006        | .029 | .866 |

Qualitative themes emerging from experimenter observations and participant comments aimed to inform the results (Appendix F). Themes included strategy and style (intuitive, insightful, lacking confidence, metacognitive, barrier focused or constained), and focus (solution but not problem, intuitive, sees failure and solution, sees problem and solution, sees problem but not solution). Participants made similar comments with regard to the helpfulness of each intervention.

Table 18  
Themes of Appraisal and Focus in Problem Solving

*strategy/style*

Intuitive: 'I want to flip it, want to make this box, have to make it somewhere else'

Insightful: 'how can I double the leftover coins?'

Lacking Confidence: 'too many cards, not enough rows, I can't do this, I suck'

Metacognitive (problem finding): cinched, took time, tested size, stared and studied

Barrier focused: 'you can't keep track, persist, don't give up, usually works'

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Constrained: 'need to fill space, no part of a plus has a right angle'

*focus*

Gets solution/impasse but not problem: filling ends, sliding pieces, need to square it off, had it but didn't see it

Intuitive: pulled on screw right away, instinct

Sees failure and solution: 3x4, impossible! Matrices, 3D, okay, what I need is a 4x4 with spaces

Sees problem and solution: I have to make enclosures, overlapping each piggy needs own square

Sees problem but cannot see solution: too much wire in clamp, I want to cut some out, bend it...

*helpfulness*

Integrated: The exercise helped me to mentally (and verbally) articulate which exact components of the task were preventing me from completing it. In other words

Control: we always approach things one way, it is important to look for new approaches, consider that maybe another way is better, we usually don't think this is even possible until we see it in something like these problems, we just need to TRY

---

## Experiment 2 Discussion

As in the previous experiment, participant responses throughout the problem solving process suggest that it is not enough to simply see the solution or see the problem, one has to be ready to see them (Table 18). Checking assumptions can be helpful, but it is also important to see the constraint one has set up because of the assumption. It is possible to intuitively arrive at a problem representation or an insightful solution, but

such a strategy is unreliable and at times the problem solver seemed ‘surprised’ when arriving at the answer. While it is possible to ‘stumble upon a solution’ it is just as easy to stumble past it. Divergence and openness can be helpful to the problem solving process but alone it is not enough to ensure the insightful solution. One further theme emerging is the idea that each individual must follow their own path to the solution. A certain level of failure seemed to be necessary before participants were willing to move on or release a strategy that was not productive. Participants perhaps needed to recognize the failure of their solutions before they were willing to attempt other solutions or recognize the barrier as a barrier rather than as the actual problem.

It is interesting to note that participants did not find one intervention any more helpful than another despite the statistically significant problem solving outcomes between training groups overall. This would suggest that participants are not cognitively aware that they are processing the problems any better than in a control situation.

The more detailed integrated focus intervention showed a greater overall effect compared to the control training intervention than in experiment 1 (22% difference in experiment 2 as compared with 10% difference in experiment 1). While inquiring into barriers had an impact on problem solving in experiment 1, extending the intervention to inquire more precisely into how these barriers interfere with goal achievement appears to be more effective for facilitation problem solving outcome.

One-way ANOVA for problem clusters (Table 14) showed a significant effect for the screw and cards/hex clusters, and a marginally significant effect for the matches and sticks/pigs/cross clusters. However, for the plate/clamp combination there was no significant effect. Descriptive statistics for individual problems show a trend in that the

integrated focus training shows a positive effect in terms of mean outcome in comparison with the control intervention across problems. Mean differences between training groups for individual problems ranged from a 0 - 35% difference.

Pearson Chi Square tests (Table 15) for individual problems across training groups resulted in significant results for the cards, hexagon, screw and 8 sticks problems, with marginally significant results for the matches 3 problem. The pigs, plates, and cross problems were all very visual, demanding not only an ability to identify the deep structure of the challenge but to then be able to visualize a shape or orientation that did not reflect imposed imagery. The more visual cognitive processing may account for the reduced training effect upon these problems as they required visually creative solutions perhaps available to some individuals and not others. While results were not significant for all problems, a positive trend is visible.

Qualitative themes emerging from experimenter observations and included strategy and style (intuitive, insightful, lacking confidence, metacognitive, barrier focused or constrained), and focus (solution but not problem, intuitive, sees failure and solution, sees problem and solution, sees problem but not solution). Participants made similar comments for interventions (integrated and control) with regard to the helpfulness of each intervention. Again, individuals do not seem to recognize that one intervention is more helpful than another which suggests that the intervention is truly 'facilitative' and works to help an individual solve problems using their own path and strategies.

At times, participants were able to move past the impasse but not see the impasse, and therefore did not see the solution. For instance, the solver may form a small plate or circle with the plates problem, but then mess the pieces up again and start over, or seek

ways to add the other pieces to the smaller circle, not satisfied with a distinct shape and not considering that there may be two shapes. As well, with the cross problem, often a solver would create the square end, but would not see it and would continue trying new pieces to fill the end of the long piece. This inability to see an impasse suggests that if the solver is not 'ready' to see the impasse they will not recognize it when they do come across it. Readiness may involve a more precise understanding and representation of the problem. The lack of recognition of the impasse supports the idea that a solver must have represented the problem in such a way that the impasse is recognized when broken.

As well, at times participants would represent the problem correctly but would be unable to generate creative solutions. At this point, a brainstorming intervention may help. Again, such a phenomenon supports the study's reasoning that creativity may not be productive or purposeful until after the problem has been represented correctly and focus has been recomposed to include both the barrier and the goal.

## CHAPTER 6 EXPERIMENT 3

### Introduction

The purpose of this experiment was to evaluate the impact that a focusing intervention would have upon participants' problem solving ability and outcome in a more realistic setting. Participants had all sustained an injury at work and thus the intervention involved generating problem solving strategies for addressing the challenges posed by workplace injuries. The dependent variable in this instance was rehabilitation and was measured using the Oswestry Disability Index (ODI; Fairbanks et al., 1990). As well, the researcher captured problem definitions and problem solving strategies qualitatively throughout the interview style intervention.

### Experiment 3 Participants

Participants were recruited by clinic managers and staff by asking them whether they would be willing to participate in a university study exploring pain and focus. Sixty ( $N = 60$ ) participants suffering from work related injury or illness were involved in the study. The participants ranged in age from mid twenties to late sixties and were enrolled in a 6-10 week term rehabilitation program at a number of sister clinics with an emphasis on activation, education, exercise, and physiotherapy.

Because the study was measuring state specific constructs, it was not as imperative to ensure a randomized sample selection. In terms of the randomization of the experiment, it was ensured that participation in the control and intervention groups was randomized from the overall sample pool.

### Experiment 3 Measures

The Oswestry Disability Index (ODI) is a 10 section questionnaire evaluating a number of realms of disability (i.e. pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, traveling, and changing degree of pain). The ODI asks participants to choose from a series of 6 multiple choice answers that describe them that day (i.e. the pain comes and goes and is very mild to the pain is severe and does not vary much). Finally, the researcher gathered qualitative data concerning participants' level of satisfaction with rehabilitative strategies (i.e. how would you rate your strategies for dealing with this injury? On a likert scale 1-5 ineffective to effective) and participants' description of the challenges associated with the injury for comparison pre and post rehabilitative program.

### Experiment 3 Design

The dependent variable in this study is rehabilitation and the independent variable is focus. A sample of sixty ( $N = 60$ ) workers were tested for disability level pre and post treatment using the Oswestry Disability Index (ODI; Fairbanks, et al., 1990). Interviews were conducted as a quasi-experimental approach to testing the integrated focusing intervention. The intervention was designed to shift the participants' definition of the problem from one of 'increasing control over the barrier' to 'finding resources to cope with the problems that the barrier creates'. In enlarging or integrating participants' focus from the barrier itself to the challenges that the barrier poses to the participant's goal, the participant is hypothetically able to let go of their desire to increase control over the barrier and instead focus on meeting the challenges that are within their power to address. Qualitative data was analyzed to inform the quantitative results.

### Experiment 3 Procedure

On the second day of their rehabilitative program, all participants ( $N = 60$ ) were given the measure of disability (ODI), as well as being interviewed as part of the quasi-experimental intervention. The intervention took on an interview structure expressed as a series of questions (see Appendix E for intervention scripts). After introductions and a short explanation for the study, the interviewer asked the intervention group members ( $n = 30$ ) to describe the nature of their injury, the strategies they had employed so far, and their satisfaction with these strategies. The researcher then asked participants to identify the problems that the illness or injury was or had been causing them specifically as a means to shift focus from a barrier focused problem representation to an integrated focused problem representation. Participants were then asked to describe the solutions that emerge for them in coping with these more ‘symptomatic’ problems. The participants’ answers were written down and then given to them as a reminder of their thought and problem solving processes in the future. The interviewer asked the control group ( $n = 30$ ) to describe the nature of their illness or injury, the strategies they have employed to date, their appraisal of the illness or injury, as well as their appraisal of their strategies.

#### *Intervention Questions*

1. Can you begin by describing your injury (when, how, what)?
2. So what have you tried doing? What strategies have you tried? And are you happy with these?
3. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most ‘stuck’ or dissatisfied with your

- strategies? Is there something that is bothering you in particular with relation to your injury?
4. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?
  5. And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)
  6. So what is most important to you then?
  7. And what are some strategies you could try to achieve that goal?

### Experiment 3 Data Analysis

#### *Quantitative analysis*

To determine whether differences in outcome (change in rehabilitation score on ODI) between conditions was significant, a one-way ANOVA with condition (integrated focus or control intervention) as a between-subjects factor was conducted.

#### *Qualitative Analysis*

Interview/interventions were also transcribed and themed to gain qualitative insights into the problem solving processes involved under each condition. Change in appraisal of strategies and barriers associated with the injury were collated pre and post rehabilitative program and compared between groups as well.

### Experiment 3 Results

Interview/interventions were conducted with sixty participants ( $N = 60$ ) following the procedure and questions as outlined above. To determine whether differences in outcome (change in rehabilitation score on ODI) between conditions was significant, a one-way ANOVA with condition (integrated focus or control intervention) as a between-

subjects factor was conducted (Table 19). In terms of qualitative analysis, transcripts were themed in accordance with the questions, and sub themed within the question itself. Descriptive statistics including gender, age, and types of injuries can be found in table 17 and 18.

Table 19  
*Gender and Age of Participants*

|                 | <i>Males</i> | <i>Females</i> | <i>Age</i> |
|-----------------|--------------|----------------|------------|
| <i>Control</i>  | 22           | 8              | 43.03      |
| <i>Training</i> | 20           | 10             | 43.26      |

Figure 5  
*Gender and Age Across Training Groups Experiment 3*

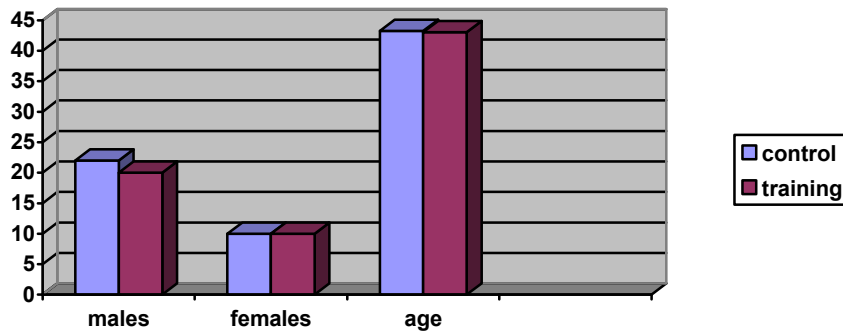
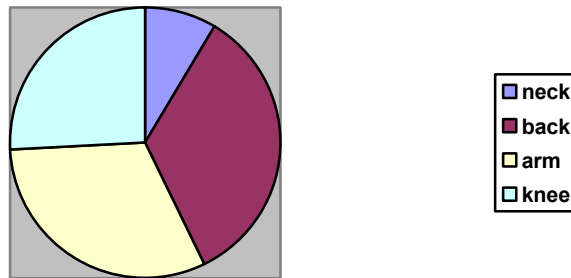


Table 20  
*Types of Injuries*

| <i>Back</i> | <i>Knee</i> | <i>Arm</i> | <i>Neck</i> |
|-------------|-------------|------------|-------------|
| 44%         | 30%         | 36%        | 10%         |

Figure 6  
*Distribution of Injuries Across Sample*



Quantitative results indicated a significant difference in rehabilitation between control and intervention groups. Clients experiencing a change were assigned a score of 2 and those who experienced no change or a negative change were assigned a score of 1. A significantly greater number of participants who experienced an intervention designed to integrate a threat appraisal with a goal focus experienced a positive change in rehabilitation as compared with those in the control group (integrated  $m = 2.00$ , control  $m = 1.86$ ,  $F(1, 59) = 4.461$ ,  $p = .039$ ,  $p \leq .05$ ). However, the mean disability scores (Table 22) for the training and control groups were not significantly different (integrated  $m = 9.2$ , control  $m = 6.93$ ,  $F(1, 59) = 2.685$ ,  $p \leq .05$ ).

Table 21  
*Descriptive Statistics and One way ANOVA Disability Change Across Training and Control Groups*

Descriptives

| Groups     | Count | Sum | Average  | Variance |
|------------|-------|-----|----------|----------|
| control    | 30    | 56  | 1.866667 | 0.11954  |
| integrated | 30    | 60  | 2        | 0        |

ANOVA

|                | <i>SS</i> | <i>df</i> | <i>MS</i> | <i>F</i> | <i>P-value</i> | <i>F crit</i> |
|----------------|-----------|-----------|-----------|----------|----------------|---------------|
| Between Groups | 0.266667  | 1         | 0.266667  | 4.461538 | 0.038983*      | 4.006873      |
| Total          | 3.733333  | 59        |           |          |                |               |

Table 22

*Descriptive Statistics and One way ANOVA Disability Scores Across Training and Control Groups*

Descriptives

| <i>Groups</i>         | <i>Count</i> | <i>Sum</i> | <i>Average</i> | <i>Variance</i> |
|-----------------------|--------------|------------|----------------|-----------------|
| dis change control    | 30           | 208        | 6.933333       | 38.34023        |
| dis change integrated | 30           | 276        | 9.2            | 19.06207        |

ANOVA

| <i>Source of Variation</i> | <i>SS</i> | <i>df</i> | <i>MS</i> | <i>F</i> | <i>P-value</i> | <i>F crit</i> |
|----------------------------|-----------|-----------|-----------|----------|----------------|---------------|
| Between Groups             | 77.06667  | 1         | 77.06667  | 2.685142 | 0.106702       | 4.006873      |
| Total                      | 1741.733  | 59        |           |          |                |               |

Transcripts are presented in a case by case analysis according to the questions asked in the intervention (Appendix E and Appendix G). As well, themes emerged across cases including appraisal of the injury, identification and appraisal of resulting barriers to personal goals, attentional focus in identifying barriers, and strategies for addressing these (Table 23). Participants fell into one of five groups based upon their focus and coping strategies (Table 24).

Table 23

*Key Themes of Appraisal and Focus*

|                            |                                                                                                                                                                                              |                                                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Appraisal of Injury</i> | <i>Threat</i>                                                                                                                                                                                | <ul style="list-style-type: none"> <li>• I worry this will not get much better</li> <li>• There is uncertainty about the future, work, income, pain</li> </ul> |
|                            | <i>Non Threat</i>                                                                                                                                                                            | <ul style="list-style-type: none"> <li>• I can handle it, I've had injuries before</li> <li>• I have support</li> <li>• I can see progress already</li> </ul>  |
| <i>Barriers</i>            | Not able to do things the way I usually do<br>Time and energy it has taken to get support<br>Lack of safety policies at work<br>Loss of control over my life and decisions<br>Loss of income |                                                                                                                                                                |

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|                                          |                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                          |                              | Increasing relationship tension                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                          |                              | Loss of opportunities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                          |                              | Getting back to work, returning to full strength                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Appraisal of Barriers / Resources</i> | <i>Threat</i>                | <ul style="list-style-type: none"> <li>• It's stressful...</li> <li>• I'm concerned...</li> <li>• I'm worried...</li> <li>• It's frustrating...</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                          | <i>Non threat Barrier</i>    | <ul style="list-style-type: none"> <li>• There's nothing I can do, they don't want to hear it</li> <li>• I've had lots of injuries, I can handle it</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                          | <i>Non threat Integrated</i> | <ul style="list-style-type: none"> <li>• I've had injuries, I know that it takes patience and it is a process</li> <li>• I can't imagine being stuck</li> <li>• I can't control that, so I focus on...</li> <li>• It takes time but I have to be 100% if I'm going to do my job well and be there for my family</li> <li>• This is an opportunity. This injury has given me some time to work on redoing my resume and gaining clarity</li> </ul>                                                                                                                                                                                                                                                                                 |
| <i>Focus</i>                             | <i>Barrier</i>               | <ul style="list-style-type: none"> <li>• There is no emotional support</li> <li>• It has taken much longer than it has to</li> <li>• They don't respect the time I have put in</li> <li>• They aren't listening</li> <li>• I felt abandoned and neglected by the health system</li> <li>• The accident wasn't even my fault. It is so unfair</li> <li>• The hardest thing is facing my boss when I tell him I want to quit, I don't know if he will lose it on me.</li> </ul>                                                                                                                                                                                                                                                     |
|                                          | <i>Barrier Challenges</i>    | <ul style="list-style-type: none"> <li>• I didn't have an opportunity to say what I was feeling, my gut instinct on this injury</li> <li>• I can't make contributions, I can't be a leader</li> <li>• I don't want them to make the decision for me</li> <li>• I can play other sports like golf, but I love baseball</li> <li>• I don't feel as productive when I'm not involved socially and actively</li> <li>• The problem with that is I then lost that joy. When I don't have that, I lose my sense of self, my purpose. I lose them and they lose me</li> <li>• I spend my time arguing for myself rather than simply getting better</li> <li>• If I'm not there, I'm not sure they will get the love they need</li> </ul> |
| <i>Strategies</i>                        | <i>Barrier</i>               | <ul style="list-style-type: none"> <li>• I just keep fighting for support</li> <li>• I spend a lot of time defending myself</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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*Integrated*

- I just try to cope with the pain
  - I take pills
  - I just don't say anything
  - I can commit in other ways. I can commit to doing the elliptical whenever it works out, commit to helping out, commit to not going to the gym because it takes time away, commit by eating healthy rather than trying to change the amount of food I eat.
  - I can seek retraining to help me get my ideas off the ground
  - I need to focus on the relationships I'm good at building
  - I get self satisfaction from playing, but if I can't get self satisfaction out of playing I can get satisfaction out of helping others play
  - I need to also be a leader in the workplace and that means taking the lead on safety
  - I focus on strengthening my body
  - I'm applying for other jobs. I'm making sure that I will be doing what I really want. I'm just going to work on this right now
  - I have to surround myself with good people, remind myself of who I am and what I do
- 

Table 24  
*Approaches to Problem Solving a Workplace Injury*

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*TRAINING GROUP*

| <i>Group A (responded to intervention)</i>             | <i>Group B (did not respond to intervention)</i> | <i>Group C (did not need intervention)</i> |
|--------------------------------------------------------|--------------------------------------------------|--------------------------------------------|
| <i>Barriers (perceived threat)</i>                     | <i>Barriers (perceived threat )</i>              | <i>Barriers and Barriers to</i>            |
| <i>Strategies (barrier focus)</i>                      | <i>Strategies (barrier focus)</i>                | <i>Resources (perceived as non-threat)</i> |
| <i>Barriers to Resources (perceived as non threat)</i> | <i>Barriers to Resources (perceived threat)</i>  | <i>Barrier Challenges</i>                  |
| <i>Barrier Challenges</i>                              | <i>Strategies (barrier focus)</i>                | <i>Goals</i>                               |
| <i>Goals</i>                                           |                                                  | <i>Strategies (integrated focus)</i>       |
| <i>Strategies (integrated focus)</i>                   |                                                  |                                            |

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*CONTROL GROUP*

*Group D (satisfactory strategies, resolved challenges)*

*Group E (unsatisfactory strategies, unresolved challenges)*

*Barriers (perceived as non threat)*

*Barriers (Perceived as threat)*

*Appraisal of Resources (satisfactory)*

*Appraisal of Resources (unsatisfactory)*

*Strategies (goal focused)*

*Strategies (barrier focused)*

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**Table 25**

*Participant Groupings Based on Perceptions and Strategies*

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| <i>Group A Example Participant<br/>(responded to intervention)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <i>Group B Example Participant<br/>(did not respond to<br/>intervention)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <i>Group C Example Participant<br/>(did not need intervention)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <i>Group D Example<br/>Participant (satisfactory<br/>solutions, resolved<br/>challenges)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <p><i>Barriers (perceived threat)</i><br/>The main frustration is with my job or position.</p> <p><i>Strategies (barrier focus)</i><br/>I went to school to get a better career and I am back where I started. It's frustrating because it seems like a waste.</p> <p><i>Barriers to Resources (perceived as non threat, able to let go of control)</i><br/>But what bothers me is this attitude that I have to 'defend' what I do. I don't really want to have to prove myself all the time. Why? What bothers me is the 'stigma', it lowers my self esteem.</p> <p><i>Barrier Challenges</i><br/>I start to believe it and I get depressed, suicidal, I feel worthless like I'm not making any real contributions. When I do prove myself I end up stuck in the same place anyway and feeling the same 'stigmatization.' I feel like I'm too busy proving myself and my real strengths aren't even being recognized.</p> <p><i>Goals</i><br/>I have a lot to offer. I need to show what I can offer, not prove that I'm good enough. I am good enough. My real goal is to show my strengths.</p> | <p><i>Barriers (perceived threat)</i><br/>There has been a lack of communication about what my options are. It's like I'm not a whole person because of my injury, because of my inability to work. There's that stress and anxiety of 'what are my options.' I feel guilty asking. People don't tell you. I wouldn't have known about this place if I hadn't asked. I have to drive an hour to get here every day but it is really important to my recovery. The drive is huge for me to do because of my back and it's expensive. But I found out that I could get compensated when talking with people here. I feel like I always have to seek it out. There is very little support.</p> <p><i>Strategies (barrier focus)</i><br/>Coming here. It is a great support network.</p> <p><i>Barriers to Resources (perceived threat)</i><br/>The lack of support is really frustrating. I feel like I can't do it all alone. I have two children to support and I need emotional support, and there is none. Without emotional support, I'm all alone. I feel like right now my kids are confused by my injury, like I can't be there for them. Without some support it is hard for me to pursue any other kind of job. I would love to teach art classes, it is something</p> | <p><i>Barriers and Barriers to Resources (perceived as non-threat)</i><br/>The hardest thing is not being able to do what I have always been able to do. My injuries aren't visible and that's hard to explain. It will also be about redeveloping how I go about sports, and the daily processes of my life. I know what it is like to recover from injuries. It takes patience and positive attitude. I'm still pretty sore and stiff but this program is helping. In a lot of ways, not just physical.</p> <p><i>Barrier Challenges</i><br/>Well, I know it is a process. I know it takes patience. I've been there. I'm ready and I know what is involved. It takes time and you have to stay positive. My injuries aren't visible, they are internal so that is hard to explain, but I know I have to fully recover before I go back, so that I'm confident and I do a good job. It's really about being there for the kids. It's all about family, the kids. I have to make sure I'm doing my best, I have such a short time with them really. It's hard to stay positive but this place is good for that, reassuring, supportive, confidence building. And you need to be positive through this.</p> <p><i>Goals</i><br/>It's really all about family, the</p> | <p><i>Barriers (perceived as non threat)</i><br/>The biggest challenge is properly strengthening my back so I can return to work with little or no chance of reaggravating my injury, not a concern and I can definitely handle it</p> <p><i>Appraisal of Resources (satisfactory)</i><br/>4/5 and does not change post program. i.e. the challenge now is stiffness with prolonged work activities, but it is improving and I am managing</p> <p><i>Strategies (goal focused) pre: physio, daily stretching, light workouts at the gym post: stretching, light workouts</i></p> <p><i>Group E Example Participant (unsatisfactory solutions, unresolved challenges)</i></p> <p><i>Barriers (perceived as threat)</i><br/>Health problems such as headaches and sleeping</p> <p><i>Appraisal of Resources (unsatisfactory)</i><br/>3/5 and does not change</p> |

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Strategies (integrated focus)</i><br/>I dream of opening a restaurant “Rock Soup Café” and I know there is support, grants, my band, the Native Friendship Ctr., aboriginal grants, family, and I can apply for that. I know I can learn and find that information (note* at one point during this discussion, she stopped icing her wrist and began to use her arm with animation to describe her plans).</p> | <p>I can do, and I would love to go back to school, but I’m so stressed and depressed that I don’t know where to start. I need that emotional support. A lack of support does not allow me to pursue the goals I have or to help my kids be strong. It makes me feel all alone.</p> <p><i>Strategies (barrier focus)</i><br/>I need emotional support in order to properly look after my kids. I want them to know me, but I can’t do what I need to do right now without some support. I’ll look into school. I’ll seek that emotional support and keep fighting for funding.</p> | <p>people I love, the kids. I have to be my best for them and that means getting back to myself, my confidence. I want to build my memory in their hearts and minds and that means I have to be positive and all there.</p> <p><i>Strategies (integrated focus)</i><br/>I’ll come here and stay focused. I have to be patient and know that it will take time, but I have to take that time in order to be there 100%. It helps to be here, it’s reassuring and it keeps you positive.</p> | <p>or decreases post program. i.e. I worry about my ability to continue fully as a production line worker and I am concerned about the cause of my continued arm pain. As well, my financial status could be up in the air</p> <p><i>Strategies (barrier focused pre and post)</i><br/><i>pre:</i> prescription drugs and sleeping pills<br/><i>post:</i> just coping with pain</p> |
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### Experiment 3 Discussion

In comparing the five approaches to problem solving a workplace injury, it is clear that the first theme to emerge across participants was the concept of appraisal. Most participants appraise their injury as problematic. The variation in outcome for both the generation of viable and sustainable strategies (integrated vs barrier focused) as well as actual rehabilitative improvement (pre – post score on ODI) appeared to depend upon the participant’s ability to ‘let go’ of a barrier focus and allow for a more integrated focus or a focus upon the problems that the barriers posed to the participants overall goals. For instance, one participant was very concerned with a perceived ‘lack of emotional support.’ She was unable to let go of this focus and look beyond the ‘lack of support’ to the problems that the lack of support might create for her in terms of her overall goals. In fact, she was unable to identify what those goals might be or what goals a lack of support actually threatened. One would think that a lack of support might threaten one’s sense of confidence in one’s self, or in one’s abilities to support one’s children. Therefore the goal is to ‘support one’s children’ as opposed to ‘fight for emotional support’. Strategies for

‘supporting one’s children’ may prove more productive than strategies designed to find emotional support when none exists.

The ability to ‘let go’ of one’s focus on uncontrollable barriers resulting from an injury such as a lack of emotional support, may enable an individual to first identify the goals that such uncontrollable threats are threatening, and then to generate solutions for achieving these goals despite the threat. However, it may be particularly difficult for certain individuals to ‘let go’ of uncontrollables, especially if they threaten particularly valuable goals such as the future of one’s children. The study’s intervention, designed to facilitate a more integrated focus that both identifies goals and addresses threats to these goals, for the most part had a positive effect in terms of facilitating the generation of more goal oriented strategies for addressing barriers and the problems these barriers posed for injured workers. Still, some participants were unable to identify the problems that barriers caused them and sustained a very strong and apparently immovable barrier focus such as the woman who fixated on gaining emotional support.

Alternatively, when a participant felt very confident in his ability to overcome the barrier, he also remained barrier focused. A willingness to ‘let go’ of a barrier focused strategy and accept that a strategy was not sustainable represents another variable for facilitating an integrated focus. For instance, one participant was quite confident that resigning himself to ‘the way things are’ was the best strategy to take:

*‘You just have to accept it, you can’t do a thing. I’ve had lots of injuries, I can get through it. I know what to do, I can handle it.’*

Despite the apparent strength of this strategy, it is barrier focused and does not generate strategies to further his goals. He identified the barriers he faces as the organizational bureaucracy and politics of his job:

*'I can't 'not do it' when I am working without wreaking havoc throughout the district program, without having to then do a lot of paperwork, upsetting my employer who has a reputation to uphold. We 'work through it' and 'always have!'. I'd have to engage the safety officer as well and she is 'a piece of work' and very judgmental. That's my only choice.'*

In 'accepting it' he is focusing on the barrier of organizational bureaucracy rather than the problems this barrier poses to his goals of rehabilitation and 'contribution.' Though he identifies his goals, he is not able to consider the problems that the organizational bureaucracy poses to his goals i.e. that they don't want to hear his ideas:

*The wheels on the carts don't work in the snow, the safety officer has all sorts of proper lifting techniques in her information but there isn't any training program in place or anyone to help us learn these techniques, only a manual. And who knows where that is? Also there has to be a number of techniques because every can is difficult and every situation is unique. But they don't want to hear it, so I don't say anything...'*

The real goal is how to voice his ideas but his satisfaction with his strategy of 'accepting it' and 'not saying anything' seems to prevent him from exploring the problem further or seeking alternatives. He is unable to recognize the unsustainability of his barrier focused

strategy despite the fact that he has ‘had lots of injuries.’ His belief that, ‘I can get through it. I know what to do, I can handle it’ sustains him for now and creates little need or motivation for him to explore the problem further.

Two avenues of insight for problem solving workplace injuries seem to exist within the interview and quantitative data:

1. an ability to ‘let go of’ uncontrollable threats in order to see the goals threatened
2. an ability to ‘let go of’ or recognize and accept a barrier focused strategy as unsustainable and unproductive in terms of goal achievement.

Throughout the research, it has been suggested that rather than focusing on attempting to shift an individual’s focus away from a barrier focus toward a more goal oriented focus it would be more productive to utilize the barrier focus in order to lead the individual to their goals while still addressing perceived threats to these goals. Rather than facilitating a ‘letting go of a barrier focus’ or ‘acceptance of failure’ or ‘acceptance of lack of control’, it may be more productive to view perceived threats as doorways to a goal focus. Unlocking creative insight may involve unlocking perceived threats. While individuals tend to take a fight or flight response when threatened, rather than turning away from a locked barrier, or attempting to smash it open, the greatest leverage may be finding the key. Finding the key to a perceived threat is achieved by exploring the problems that the threat poses to one’s goals. In exploring threat symptoms in this way, we open the door to a goal focus without attempting to simply bypass the doorway. Perceived threats offer an individual pathway to both problem representation and solutions.

While further research is necessary to identify the mediating variables accounting for the tendency of human beings to fixate on barriers or barrier focused strategies, the present research suggests that a barrier focus inhibits effective workplace injury problem solving and rehabilitation.

## CHAPTER 7 CONCLUSION

### Summary

The present study proposed to explore the ways in which attentional focus influences problem solving and performance outcomes because insight into the mechanisms governing attentional focus may assist in the development of interventions to facilitate performance and problem solving. The objectives of the present study were to conduct two lab and one field experiment within the context of insight problem solving for it is believed that insight and problem solving are key elements to performance of any kind. Researchers have conducted attentional focus research and training mainly with single samples (i.e. test anxious students, athletes, problem solvers). It was the aim of this study to test the theoretical principles of attentional focus within two problem and performance contexts (laboratory problems and the challenges of a workplace injury) in an attempt to generalize attentional focusing theory across samples. The experiments examined the impact that different kinds of attentional focus interventions had upon problem solving performance approach and outcome.

It was hypothesized that a more precise representation of the problem would provoke more creative and sustainable solutions than either a barrier or goal focus alone. Barriers provide clues to a more precise representation of the problem by helping a problem solver link to the actual goal of the problem. A barrier is only threatening because it threatens a goal. By penetrating the barrier to the goal, one generates a more integrated representation of the problem and subsequently unlocks more creative and relevant solutions that also address the threat. It was hypothesized that an integrated focus

would enhance both problem solving ability and outcome on a variety of problem solving tasks.

The results of the study confirm to varying degrees that an integrated focus supports problem solving outcome and approach in both the lab and a field setting. While the degree of impact varies depending upon the nature of the problem, a trend was visible and encourages future research.

### General Discussion

The purpose of this study was to determine in what ways a person's perception and focus impact problem solving and performance. A number of physiological, psychological, and sociological variables interact to help or hinder an individual's performance outcome, making it difficult to isolate causal factors (Brooker et al, 2000; Schrey, 1996). One area of research that seems to offer insight into how best to facilitate problem solving and performance is that of attentional focus. Attentional focus in turn may be impacted by perception and stress. Cognitive psychologists have shown that challenges of any kind generate arousal or a state of 'stress' in individuals (Bandura, 1977; Lazarus & Folkman, 1987). If a challenge is perceived to be a barrier in that it threatens goal achievement, as when an injury threatens a worker's capacity to work, the individual will then evaluate whether she has the resources to manage the barrier. If she perceives herself incapable of managing the barrier posed by the injury, her focus will turn to controlling, changing or avoiding the threat rather than on how best to attain the goal (Lazarus & Folkman, 1984b). It would seem then that appraisal, stress, and focus play critical roles in generating or resolving barriers to performance of any kind.

Facilitating a shift from threat focus to goal focus has proven to be challenging as people are reluctant to relinquish a threat focus until the threat is resolved. Likewise, attempting to change an individual's appraisal of resources (i.e. their ability to confront a feared activity) may prove less productive than understanding the problems that such an appraisal creates for the individual. Changing beliefs can be just as complex as researchers have shown a constellation of factors influencing individual belief systems. Focusing on trying to increase their resources or change their self efficacy beliefs can prove to be frustrating and fruitless. Helping individuals to link their negative self efficacy beliefs to their goals (i.e. what problems does the fact that I do not have the personal resources to manage this stress create for me?) appears to help unlock creative solutions for achieving goals. Illustrating the link between barrier and goal may serve to both acknowledge the barrier and remind the solver of the goal or challenge inherent within the problem task, ultimately resulting in a shift from performance-degrading threat focus to a performance-enhancing integrated focus.

The objectives of the present study were to conduct two lab and one field experiment within the context of insight problem solving. Attentional focus research and training has been conducted mainly with single samples (i.e. test anxious students, athletes, and problem solvers). It was the aim of this study to test the theoretical principles of attentional focus within two problem and performance contexts (laboratory problems and the challenges of a workplace injury) in an attempt to generalize attentional focusing theory across samples. The experiment examined the impact that different kinds of attentional focus interventions have upon cognitive appraisal, coping, and performance outcome. The results illustrate some support for the integrated focus intervention and

suggest that a more integrated focus can serve to unlock a more precise representation of the problem, and consequently unlock creative solutions that are more sustainable and relevant.

Secondly, the experiment explored the relationships between attentional focus, cognitive appraisal, and goal attainment. In particular, the study explored the mediating variables operating within the cognitive appraisal, attentional, and performance/problem solving processes. It was hypothesized that cognitive appraisal of a threat has a causal influence upon the dependent variable (performance outcome) because focus acts as a mediating variable. That is, the individual's ability to focus on the performance task varies with the individual's performance outcome. Implications for intervention design are significant. Helping an individual see the link between perceived threats and personal goals should serve to shift focus from threat focus to an integrated barrier + goal focus and result in enhanced performance compared to individuals who remain solely threat focused. Results from the study support the connection between stress, appraisal and focus and suggest that facilitating a more integrated focus by helping individuals to see both threats and goals in a problem situation, as well as the link between the two concepts, may support performance outcome.

Ansburg and Dominowski (2000) in a series of experiments designed to test insight problem solving training procedures, argued that elaboration and constraint relaxation training procedures taught participants how to process problems for underlying structure 'By encouraging solvers to go beyond the details of content, one can increase the likelihood that they will access useful, but inert knowledge' (p. 50). Though accessing 'inert knowledge' may prove to enhance problem solving (Renkl et al., 1996), it is argued

here that simply ‘seeking’ or being open to a deeper structure of a problem is just the first step of gaining insight. The readiness to ‘see’ the actual deep structure of a problem may require greater clarity and connection. The present study aimed to extend the research on how to process problems for underlying structure by facilitating a more specific pathway to the deep structure of a problem. Unlocking creative insight by finding a route to the root of the problem offers greater leverage for generating solutions. In this way, insight problem solving is both a root and route finding process.

The present study demonstrates that inquiring into and identifying perceived threats or barriers can be facilitative to performance and problem solving on both laboratory insight problem solving tasks and when confronting the challenges of workplace injury in a realistic field setting. The study aimed to test the validity of an intervention designed to manipulate attentional focus in such a way that barrier and goal are linked. Enlarging the focal frame to include both barrier and goal may produce a more accurate problem representation as opposed to a delimited threat appraisal. It is theorized that an accurate problem representation thereby solicits more accurate and creative solutions. Qualitative data confirmed that the problem solving process is complex and, though intuition, openness, problem representation, perseverance and metacognitive awareness are all important factors, creative insight may be a constellation of all of these factors. In fact, insight appears to be about interdependent connections, between cognitive processes, between an individual’s interactions with their environment, and between aspects of a challenge itself.

For instance, when an individual is experiencing a problem solving task such as a workplace injury or a more mechanical problem, for the problem to be solved, the

individual must first be aware of perceived threats associated with the injury or problem such as loss of personal activity such as hobbies. In order to find sustainable solutions, they must then link their insight to the fact that the lack of activity poses challenges to their overall goals of purpose and identity. In making this connection, the individual can now generate new strategies for developing purpose and identity, rather than pointlessly trying to regain prohibited activities. Perceived threats are a result of an individual's interaction with their environment. Growing up, this individual found purpose in her hobbies such as fixing cars for a variety of reasons, both economic, social, physical and psychological. A constellation of beliefs would lead her to value her hobbies and link them to identity and purpose. Finally, connections must be made by the individual all along the problem solving process for the relevant insights and solutions to emerge. While a therapist may point out for this individual that she needs to focus on alternative means to develop her sense of purpose and identity, unless she has made the connections between her hobbies and her sense of purpose and identity, she may not see the relationship. She can see a connection by asking herself what problems the injury creates for her? When she identifies the loss of her hobbies as the main concern, she can then explore what makes the loss of her hobbies a problem? What worries her about not being able to fix cars because of her back injury? Threats are only perceived as such because they threaten highly valued goals. Exploring perceived threats leads the individual directly to their goals.

#### Contributions to the Field

A key insight from the study was into the path people follow when addressing threats and challenges: when a challenge is appraised as threatening, one applies prior

knowledge and assumptions which constrains thinking and, more importantly, constructs barriers. Until now, constraints have been conceived as one and the same as barriers (Knoblich, Ohlsson, Haider, & Rhenius, 1999; Ohlsson, Knoblich & Haider, 1996. The present study argues that the assumptions applied from prior knowledge, constrain thinking and result in the construction of a barrier which then assumes the role of ‘problem’ for the solver.

For instance, in the cross problem, the assumption the solver brings may be that the long piece must represent one of the cross-pieces either vertical or horizontal. This assumption constrains thinking imposing limits upon the problem itself and consequently upon solutions. For instance, if it is assumed that the long piece must be a cross-piece in order to build a cross from the given pieces, then the only way to turn the long piece into a cross piece is to ‘fill in the end.’ This imposed constraint leads to, or constructs, a barrier because of course the long piece cannot be ‘filled in at the end.’ The solver begins to treat the barrier, the fact that ‘the long piece cannot be filled in at the end,’ as the problem and begins to consider the barrier to be the problem, spending time ‘trying to fill in the end somehow.’ Meanwhile, attention is diverted from the actual problem which is ‘to construct a cross using the pieces provided.’ However, all is not lost if the solver reaches this point of barrier construction and focus for a point of promise lies within the barrier itself. The barrier holds clues to the actual nature of the problem, the goals of the solver, and more sustainable solutions. If we ask the solver ‘what is getting in the way, what is the barrier?’ they explain that the long piece is getting in the way. If we ask ‘what bothers you about that long piece? What is the barrier?’ the solver explains that the problem is that ‘it seems impossible to fill in the end of the one piece to make a cross

piece.’ It is here that we can inquire into assumptions: ‘what assumptions are you making then?’ The solver can then articulate that they are assuming that the long piece must represent a cross-piece. They are assuming that the end must be filled in. We can then ask ‘If the long piece cannot be filled in, what bothers you about that? What is the problem this creates?’ the solver explains that the problem then is that they cannot create a square end for the cross and ‘you must have square ends somehow.’ We can then ask, what is the real challenge given this barrier? Aha! The solver can then articulate the challenge as ‘how can I make square ends if not with this long piece?’ and their creativity is thus tested. While the ‘correct solution’ may be to turn the long piece on an angle, other solutions were generated such as making a ‘negative space’ cross, and building a 3-dimensional cross. Creative solutions emerge once the problem is defined more precisely.

The barrier actually leads to the challenge quite directly. The path from barrier to a more precise problem representation makes sense because something is only a barrier because it threatens a goal. Rather than focusing upon the barrier as the problem, one can explore the challenges that the barrier poses. The challenge the barrier poses in the cross problem is ‘how does one create square ends without using the end of the long piece?’ Stating the problem in terms of both barrier and goal unlocks an individual’s creativity and leads to more sustainable, specific solutions.

Likewise, penetrating the barrier in order to find a more clear representation of the problem may enhance creative problem solving capacity when facing a workplace injury. When faced with a workplace injury that is perceived as threatening, an individual will apply prior knowledge and assumptions to the problem. For instance, the injured worker may assume that when injured and unable to work, she must ‘seek out emotional support’

or 'suck it up' or 'fight the system' in order to resolve the challenges associated with the injury. Such assumptions constrain thinking by assuming that 'the only way to get through the injury is if emotional support is given' or 'the only way to get through this is to simply accept it because nobody is listening' or 'the system is out to get me.'

Constrained thinking then constructs barriers. For instance, 'there is no emotional support available to me' or 'it makes me crazy to just sit back and take it' or 'nobody is listening to me.' The individual then treats the barriers as the problem and fixates upon the barrier spending a great deal of time 'trying to get emotional support' or 'trying not to let it get to them' or 'trying to be heard.' In each case, penetrating the barrier leads to a clear representation of the problem and this clarity in definition then provokes more creative solutions. By inquiring into the barriers themselves, it becomes clear that what is really bothering the individual is that 'without emotional support, she worries that she won't be able to look after her children on her children.' The real challenge then is 'how do I ensure that my children are cared for while I am injured?' Another individual realizes that what is really bothering him about not having any control in his job is that he is unable to voice and implement the solutions he and his coworkers have generated. The challenge then is 'how do I voice and implement the solutions to workplace problems that I and colleagues have generated?' Another individual realizes that what bothers her about not being heard is that 'she is spending all of her time defending herself rather than healing.' The real challenge is 'how does she ensure that most of her time is spent getting better despite the bureaucratic process she must undergo to afford herself the time to heal?' The key to generating creative solutions hinges upon representing the problem at its core. The

clarity of problem representation can be accomplished by understanding and inquiring into the barriers people construct when faced with a challenging problem.

#### Limitations of the Study

Limitations to the study include small, convenient samples for each of the three experiments limiting the generalizability of the results. While each of the three experiments included a satisfactory sample, a larger sample would support greater reliability. This research should be replicated using a more heterogeneous sample as well considering the imbalance in gender. While the second experiment demonstrated no correlation between problem solving capacity and gender, it would strengthen results to control for gender. Further study of the intervention principles applied to a broader, more random sample is recommended.

As well, multiple experimenters and a double blind approach would serve to eradicate any threat of experimenter bias. As it was, the three experiments were conducted by one experimenter. In order to validate the effectiveness of the intervention, an experimenter who is unaware of the implications or history of the project should conduct future experiments utilizing the integrated focus intervention.

Finally, while the present study offers promising results with regard to generalizing the effect of a focusing intervention across levels of ‘realism’ by applying the intervention within a field setting, the field sample and scenario for the current research was limited to rehabilitation and the challenges of an injury. Testing the intervention in an academic setting in which students are facing exams or performance reviews, an organizational setting where employees or leaders are tackling challenges in communication, production, or decision making, or in an athletic setting where athletes

are under extreme duress pre-performance. It would be worth evaluating both the content and process of the integrated focus within a variety of settings to test for both reliability, functionality, relevance and performance impact.

#### Future Research Implications

Implications for future study include testing the integrated focus intervention in a variety of settings including academic, athletic, and organizational fields. As well, exploring the concept of domain specificity and identifying a typology of problems may serve to expand the understanding of the problem solving process. The study raised important questions regarding problem solving and performance. In particular, it is still unclear why participants do not necessarily recognize when they have identified the root of a problem though it is hypothesized here that individuals have not represented or framed the problem correctly and thus will not notice the impasse or any solutions that breaking the impasse may lead to. Future studies would compare the integrated focus intervention against performance using divergence exercises like ‘brainstorming’ or ‘remote association’, and methodical ‘creative problem solving’ techniques. Documenting the insight process more precisely and fully will continue to challenge researchers as well.

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## Appendix A – Consent Form

You are being invited to participate in a study that is being conducted by Dr. Jim MacGregor and Dr Bart Cunningham and Mrs. Jennifer Walinga (PhD candidate), in the School of Public Administration at the University of Victoria. If you have further questions you can contact them at 721-6435 or 721-8059. The research is funded by the Social Science Research Council.

The purpose of this research project is to further understanding of the processes of solving problems. Research of this type is important because, by understanding, we may be able to find means to promote more creative and effective problem-solving. Potential participants have been recruited by advertisements placed on campus and by word-of-mouth to contact us if interested in taking part in the research project.

If you agree to voluntarily participate you will be asked to solve a number problems. Also, you will be asked a few questions about your experience. The first session should take around 60 minutes. There are no known or anticipated risks to you by participating in this research.

The potential benefits of your participation in this research include the enjoyment of tackling problems. At the same time, you will be helping us further our understanding of problem solving. As a way to compensate you for your time, you will receive \$20. It is important for you to know that it is unethical to provide undue compensation or inducements to research participants and, if you agree to be a participant in this study, this form of compensation to you must not be coercive. If you would not otherwise choose to participate if the compensation was not offered, then you should decline.

Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you do withdraw from the study any data collected up to that point will be excluded from any analysis.

Your confidentiality and the confidentiality of the data will be protected by storing the data collected in a locked filing cabinet or in password-protected electronic form.

It is anticipated that the results of this study will be shared with others in the form of journal articles and presentations at scholarly meetings.

In addition to being able to contact the researcher [and, if applicable, the supervisor] at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Associate Vice President Research at the University of Victoria (250-721-7968).

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

PARTICIPANT SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

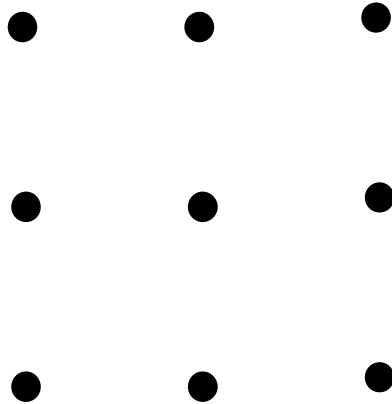
## Appendix B – Experiment 1 Training Scripts (all conditions)

Introduction: (all conditions)

Thank you for volunteering to take part in my experiment. It's designed to try to get a closer look at how people complete certain tasks, and during the experiment I'll be asking you to answer a number of questions and to do several problems. The whole procedure should take about an hour. Here is the consent form for you to read and sign. Please take your copy. For the first set of problems, I'll explain the task, then give you 4 minutes to try to complete it. The 4 minutes is not designed to exert any pressure on you but rather to guide us through the hour without going over time. If you finish within the 4 minutes then we'll move on to the next task. Any questions?

Ok, first of all, I'll give you an example of the kind of problem that you're going to see:

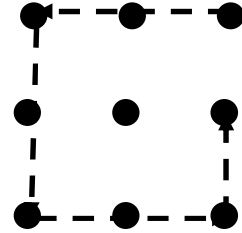
The task is to draw 4 straight lines through each of the 9 dots below, without lifting the pencil or retracing a line.



## Assumption Training Script:

Before we start on the problems I want to take a few minutes to give you a couple of principles to bear in mind that may help you if you get stuck. When you try this type of problem, your immediate thought or instinct is likely to be misleading.

*For example, this is typical of the first attempt that people make on the 9-dot problem—90% or more do something like this*

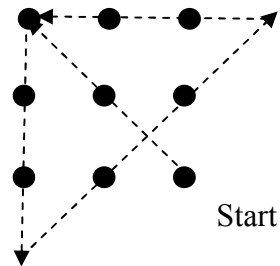


You see, we tend to read things into the instructions. One reason that this type of problem is so difficult is because people place unnecessary limits on themselves. They make assumptions about what is allowed and isn't allowed that stops them from finding the answer. Typically people aren't even aware that they are doing this. Here are some of the implicit assumptions that prevent people from finding this answer.

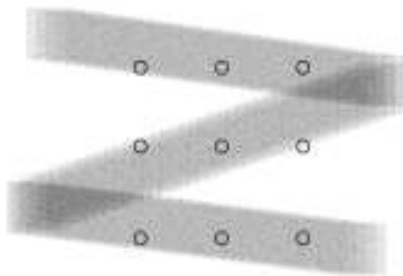
- you have to stay inside the “square”. *No, you can go “outside of the box”.*
- lines have to be vertical or horizontal. *No, they can be diagonal.*
- you have to connect dots. *No, you can start or stop a line where there is no*

*dot*

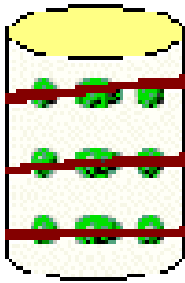
Here is a correct solution to the 9-dot problem.



There are more hidden assumptions people make on the 9-dot problem. Here are two of them. Lines have to be thin. *No, using a thick pencil you could join the dots with just three lines:*



The paper has to remain flat. *No, you can roll the paper into a tube and connect the dots with a single line that goes around the cylinder.*



So I will be giving you some reminders throughout the session:

1. Are your first impulses misleading?
2. If you are stuck, is it because you are making a wrong or an unnecessary assumption?

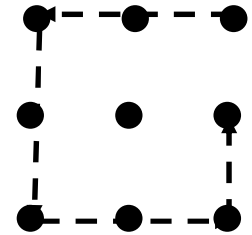
Let's see if the two pieces of advice help you on some further problems. As you tackle them, try to remember to ask yourself:

1. Are your first impulses misleading?
2. If you are stuck, is it because you are making a wrong or an unnecessary assumption?

### Goal Training Script:

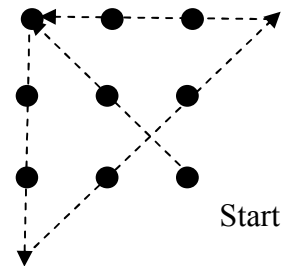
Before we start on the problems I want to take a few minutes to give you a couple of principles to bear in mind that may help you if you get stuck. When you try this type of problem, your immediate thought or instinct is likely to be misleading.

*For example, this is typical of the first attempt that people make on the 9-dot problem—90% or more do something like this*



You see, we tend to change the goal of the task to be that of ‘joining up all the dots one after another’ and we tend to focus on ‘making this strategy work’ when really the goal is slightly different and involves ‘drawing 4 straight lines through each of the 9 dots below, without lifting the pencil or retracing a line.’ We often end up focusing on the wrong goal. We create a new goal such as ‘making a specific strategy work’ and this makes us lose sight of the original goal of the task.

Here is a correct solution to the 9-dot problem:



The real goal is to pass ‘through’ the lines, not necessarily join them together.

So I will be giving you some reminders throughout the session:

1. When you think about what you are focusing on trying to do right now, are you focusing on the right goal?
2. What is the goal of the task again?

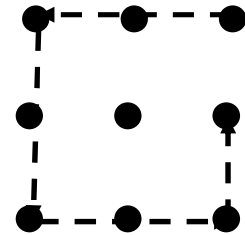
Let’s see if the two pieces of advice help you on some further problems. As you tackle them, try to remember to ask yourself:

1. When you think about what you are focusing on trying to do right now, are you focusing on the right goal?
2. What is the goal of the task again?

### Integrated Training Script:

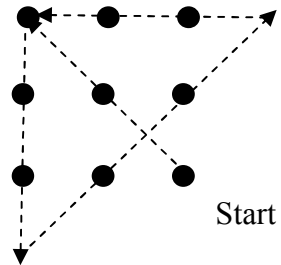
Before we start on the problems I want to take a few minutes to give you a couple of principles to bear in mind that may help you if you get stuck. When you try this type of problem, your immediate thought or instinct is likely to be misleading.

*For example, this is typical of the first attempt that people make on the 9-dot problem—90% or more do something like this*



You see, we tend to focus on the barrier rather than the goal of a task. We try to overcome the barrier (not enough lines, too many dots) and in doing so, make the barrier our goal. By accepting the barrier as something that won't work, it opens us up to the real challenge the barrier creates which is how to create '4 straight lines that pass through each of the 9 dots below, without lifting the pencil or retracing a line' rather than 'capturing as many dots on one line as possible. A barrier focus actually gets in the way of the solution and of seeing the challenge for what it is.

Here is a correct solution to the 9-dot problem:



Focusing on the barrier (there aren't enough lines, or there are too many dots) prevents you from seeing the actual challenge (how do I draw the lines in such a way as to pass through all 9 dots).

So I will be giving you some reminders throughout the session:

1. What is it that is getting you stuck or is getting in the way?
2. If you can't change this, what is the challenge you are faced with now?

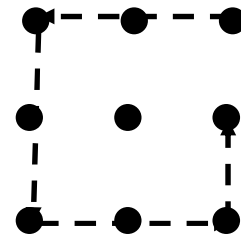
Let's see if the two pieces of advice help you on some practice problems. As you tackle them, try to remember to ask yourself:

1. What is it that is getting you stuck or is getting in the way?
2. If you can't change this, what is the challenge you are faced with now?

## Control Training Script:

Before we start on the problems I want to take a few minutes to give you a couple of principles to bear in mind that may help you if you get stuck. When you try this type of problem, your immediate thought or instinct is likely to be misleading.

*For example, this is typical of the first attempt that people make on the 9-dot problem—90% or more do something like this*

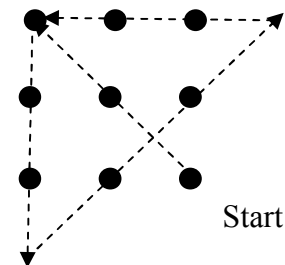


You see, we tend to find these problems difficult for a number of reasons. please listen as I read some information about why problems are difficult and how solutions can be achieved. It might help you solve these problems.

1. To solve some problems, specialized knowledge may be required, and acquiring that knowledge may take considerable time and training. For example, solving an advanced problem in physics requires extensive training in physics. For problems which do not require specialized knowledge, one source of difficulty may be the failure to think of something one does know and that would help to solve the problem. Quite often, we can have trouble remembering something ‘right here and now’ that we do know. Finding the solution might require recalling a relevant fact, and failure to solve the problem may be nothing more than failure to remember. This implies that good memory will be associated with good problem solving, but it must be kept in mind that solving problems can require more than just remembering.

2. Some problems are difficult because they are too large – there are so many alternatives to consider that it can be difficult to explore them all and to keep track of which ones we have tried vs. which ones still need to be checked. To succeed on such problems a person needs to systematically consider alternatives and keep good (mental or physical) records of which ones have been tried. Thus, systematic search can be added to good memory as qualities that might aid problem solving.

Here is a correct solution to the 9-dot problem:



Solving these types of problems may require you to simply recall a fact or principle you already know, or they may require you to keep better track of strategies you have attempted.

So I will be giving you some reminders throughout the session:

1. Is there a principle or fact you may not be remembering?
2. Is this problem difficult because it is difficult to keep track of?

Let's see if the two pieces of advice help you on some practice problems. As you tackle them, try to remember to ask yourself:

1. Is there a principle or fact you may not be remembering?
2. Is this problem difficult because it is difficult to keep track of?

### Appendix C – Process Questions

After participating in this exercise (solving problems and rethinking the goal of the problem), do you think the exercises you went through have enhanced your ability to tackle similar problems in the future?

|                      |          |         |       |                   |
|----------------------|----------|---------|-------|-------------------|
| Strongly<br>disagree | disagree | neutral | agree | strongly<br>agree |
| 1                    | 2        | 3       | 4     | 5                 |

In what ways has the exercise helped or hindered your problem solving ability?

We did a number of different types of problem solving tasks, on a scale of 1-5 how would you rate how much you liked/disliked each type and why?

Pencil/paper

|                 |         |         |      |              |
|-----------------|---------|---------|------|--------------|
| totally dislike | dislike | neutral | like | totally like |
| 1               | 2       | 3       | 4    | 5            |

Why?

Manipulatives

|                 |         |         |      |              |
|-----------------|---------|---------|------|--------------|
| totally dislike | dislike | neutral | like | totally like |
| 1               | 2       | 3       | 4    | 5            |

Why?

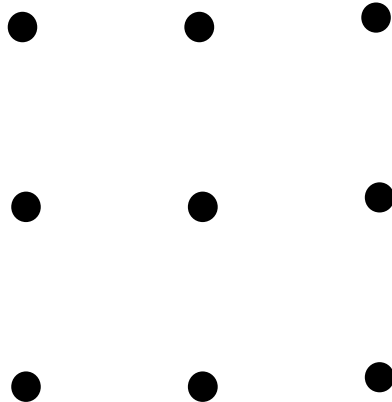
## Appendix D: Experiment 2 Training Scripts

Introduction: (all conditions)

Thank you for volunteering to take part in my experiment. It's designed to try to get a closer look at how people complete certain tasks, and during the experiment I'll be asking you to answer a number of questions and to do several problems. The whole procedure should take about an hour. Here is the consent form for you to read and sign. Please take your copy. For the first set of problems, I'll explain the task, then give you 4 minutes to try to complete it. The 4 minutes is not designed to exert any pressure on you but rather to guide us through the hour without going over time. If you finish within the 4 minutes then we'll move on to the next task. Any questions?

Ok, first of all, I'll give you an example of the kind of problem that you're going to see:

The task is to draw 4 straight lines through each of the 9 dots below, without lifting the pencil or retracing a line.



Insight Training Integrated Script Experiment 2:

(Word count 119)

1. What do you find yourself focusing on? What strategies have you been trying?
2. Why are you using these/these strategies? What are you trying to do? And why do you want to do that? What is actually important to you?
3. Is your strategy working?
4. Why not? What is getting in the way?
5. And what assumptions are you making? What are you assuming is necessary in order to solve this problem?
6. What is posing a barrier for you? And how is that getting in the way? What makes that a problem? What bugs you about it?
7. So what are you really trying to do? What is your real challenge? What is the real problem?

Insight Training Control Script Experiment 2:

(word count 116)

1. What do you find yourself focusing on? What strategies have you been trying?
2. Why are you using these/these strategies? What are you trying to do?
3. What is the task again? What was the original problem as it was set out? What was your original goal?
4. Could the task involve some sort of principle, concept, or fact that you already know but haven't considered?
5. Could it be that you are simply not remembering something? Would it help to scan your memory for similar problems such as this?
6. Is this problem difficult to keep track of? Are you keeping track of what you have tried and haven't tried, of all the possibilities?

## **Appendix E: Workplace Injury Transcripts**

*Integrated Focus Training Group (n = 30)*

Participant 1:

*1. Can you begin by describing your injury (when, how, what)?*

I worked in a brewery and was injured trying to catch a keg as it toppled from a hand truck/dolly. I reached forward to catch it and put my back out. I kept going and worked the rest of the day but the next morning I couldn't get out of bed.

*2. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The most frustrating thing about this injury has been the workplace itself. The atmosphere of the workplace is unsupportive and unmotivating. The accident happened because I was trying to save the keg from damaging a great deal of inventory. I wonder 'was it worth it?' I am not motivated to return to this kind of environment because the owners have changed their philosophy and are no longer as committed to the workers. There is a great deal of suspicion and mistrust in the workplace and the owners have even hired a company that co-workers can call to 'rat' on one another. I was once suspended for suspicion of drinking and later disproved the claim. I and my co worker were given a small settlement but no apology.

*3. So what have you tried doing? What strategies have you tried? And are you happy with these?*

Mostly I just focus on my outside life and what I love to do, my buddies and trying to have an enjoyable day driving the truck. I 'try not to let it get to me.'

*4. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

It is tiring to have to focus on blocking out the negative. Sometimes I worry that it creeps into my personal life. I am an honourable, positive guy who wants to do what is right. It is difficult to operate within a workplace that is so negative and destructive. I have a wonderful family and don't want work stress to harm my personal life. I don't

want to sacrifice family especially if it is for a workplace that does not share similar values to me.

5. *And what problems has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I don't want my personal life harmed because that is where I draw my strength from.

6. *So what is most important to you then?*

Family and friendship are most important. Honour and integrity are everything. I want loyalty and purpose in what I do and in my relationships.

7. *And what are some strategies you could try to achieve that goal despite the barriers and frustrations?*

I will focus on sustaining strong relationships at work with my long time coworker in particular and in taking pride in the fact that I 'do the right thing' (like catching a keg before it creates a bigger problem). When I am home, I am home and I will focus on being the best I can be there rather than trying to change what I can't at work.

Participant 2:

1. *Can you begin by describing your injury (when, how, what)?*

I injured my arm at work as a caregiver for the elderly. I have injured it before doing similar lifting and moving but this is the worst it has ever been.

2. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

I would have to say that the biggest barrier I am faced with is driving. I need to be able to drive to get to the clinic and to get to work. I live a 40 minute drive from the clinic making driving the biggest barrier to healing.

3. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I just try to do what I can. I can always figure something out. I drive with my left arm and I reach across to move the car into park or drive etc. I am pretty happy with how things are going. I feel like it is getting better.

*4. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I hate not contributing, having to depend on others. Even my family has to help with certain things around the house. It bugs me how I can't get in there and do things.

*5. And what problems has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

When I can't do things, I feel useless and dependent.

*6. So what is most important to you then?*

I want to get back to work, but mostly I want to feel like I can be useful at work.

*7. And what are some strategies you could try to achieve that goal?*

I guess my biggest challenge is finding ways around the injury. I really just have to accept the injury and the limitations it creates for me. I can't change it and I can't force it to improve. It is coming and I need to just figure out ways to do things without my arm. If I can't get better, then I'll just do something else at work. There is lots for me to do there, and I can avoid the lifting and moving that I have been doing. I just have to arrange it with my team.

Participant 3:

*1. Can you begin by describing your injury (when, how, what)?*

I am a (window) glazer and was working up on some scaffolding. The scaffolding was about 4 feet from the wall of the building and I was working on the window, trying to lift the window into place, when I felt my back twinge. I kept working the rest of the shift, but had trouble getting into the truck and the next day I was on my hands and knees to go to the bathroom.

*2. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

I can't do the things I love. I am a big guy. I'm a capable guy; I don't like not being able to do things when I want. I don't like the feeling of being helpless or dependent. It's frightening and unsettling. I think, wow, it can happen anytime. I guess I'm not as strong as I thought.

3. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I just focus on getting better, taking care of it. Getting stronger.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

The vulnerability, yes, it's unsettling. I don't like feeling so out of control.

5. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

When I'm not in control, I can't make my own decisions, I feel like things can be taken from me. I'm going sailing on my boat. We've planned a trip and have been planning it for years. I don't want anyone telling me I can't do it. I don't like the thought of not being able to go.

6. *So what is most important to you then?*

I'm going.

7. *And what are some strategies you could try to achieve that goal?*

I'll do whatever it takes to go. I don't have to stand, I can figure ways around it. If I can't lift and move, I'll figure out solutions. I can still sail.

Participant 4:

1. *Can you begin by describing your injury (when, how, what)?*

I hurt my neck and shoulder lifting big items at the store. I felt a sharp pain, kept working, then the next day couldn't move my arm.

2. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

It's not been too bad. I'm getting help here. It's getting better. I can feel it's improving and I'm not worried. I guess the hardest part has been just being off work, but really it won't be for long and I'm almost good as new.

3. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

The physio and exercise here is pretty much taking care of things. I'm on the right track.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Being off work is hard but I just come here and focus on my program. It makes the time go.

5. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I guess what is hardest about being off work is making sure I keep myself busy and focused.

6. *So what is most important to you then?*

I guess it's most important to have a goal and a focus.

7. *And what are some strategies you could try to achieve that goal?*

I'm keeping busy.

Participant 5:

1. *Can you begin by describing your injury (when, how, what)?*

I hurt my back working in the home for the elderly where I have worked for nearly 20 years. I guess it was all the lifting and moving. I've had injuries before though. I can handle it. I guess I'm getting older though.

2. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

You know, I'm the smile guy. I'm the guy who the patients and my fellow workers look to for some positive energy and laughs. I'm not able to be there for them in the same way. I've worked with my wife at the same place for a long time. We have fun.

We really enjoy working and we spend all our time together. I haven't been around as much you know? I haven't been able to be there for people, to be available.

3. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

Well, I really just do what I can. I have to come here and get better, that's my first focus. I have to take care of the injury and I go in sometimes for a short shift. I can go in and just sit with the patients. I can't really do much heavy stuff, but I can get them laughing. You know, we have done some good things there, some fun things, parties and events, it makes everyone feel a little brighter.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I guess what is hardest about not being there, not being available is that I can't connect like I usually do. I usually spend time with my wife driving there and back, we spend a lot of time together. I have some real close relationships with the patients too.

5. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

What's hard about that is I start to feel bored. Really bored. I hate sitting around. I need to be doing things.

6. *So what is most important to you then?*

I want to feel useful. I want to be busy and doing things. I had this patient and he was dying. He called for me. He asked for me and I went to see him and sat with him. I held his hand (crying) and said, 'let go, it's okay' and he did. I want to do people's hearts good.

7. *And what are some strategies you could try to achieve that goal?*

I need to focus on the relationships I'm good at building. But first I have to take care of myself so that I can be there for others.

Participant 6:

1. *Can you begin by describing your injury (when, how, what)?*

I am a paramedic and I had stopped at the scene of an accident, the person was large, heavy and my partner, well he doesn't really know what he is doing, and I had to

do it mostly by myself so I did, I mean you have to do what you have to do. This person was quite a ways down a hill from the ambulance and I guess I really strained my arm lifting this guy.

*2. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

There have been a few. It really interferes with what I love to do. You know, it has interfered with my relationship with my spouse (physically) and I like to do a lot of things. I like to work on cars and lift weights. I have a good buddy I lift weights with. I need to get back to that. Financially it's hard. Who knows how long I'll be off work. And work. It bugs me how the guys at work think I'm just slacking off. I mean, you try it, you try this injury for a while.

*3. So what have you tried doing? What strategies have you tried? And are you happy with these?*

Well I have had a few injuries, and I know how to deal with them. I burned my hand brutally (shows me) and had 3<sup>rd</sup> degree burns. I've hurt my back and my shoulder before. It took a long time but you just have to reframe, be positive, see the bright side. I mean I could have been killed but I just hurt my hand, and my hand is going to be okay. You know, coworkers they bug me and say, hey you don't have much luck do you? But I say, I'm the luckiest guy on earth.

*4. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Well, I'm worried that I won't get the car ready with my son in time for his grad. And you know I want to be there for him. I want to get back to the weights and back to work, so I can be there for my family. I don't want to let them down like my dad let me down.

*5. And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

If I let them down, they won't have that sense of confidence and strength I think they need.

*6. So what is most important to you then?*

It's important to me. I screwed up with my first kids, I don't want to screw up now. I want this car ready for his grad so that only he and his date can ride to grad, I don't want him in some big carload of kids getting into trouble. This car is perfect.

*7. And what are some strategies you could try to achieve that goal?*

I need to just get better so I can be there and finish this thing.

Participant 7:

*1. Can you begin by describing your injury (when, how, what)?*

I hurt my knee. I work for the city and stepped from one level to another, went over on my ankle and felt this hot pain drive right through my knee. Wow. I knew I had done something serious. It took 2 months before I could get in for surgery then I went in for physio for 2 months, an assessment and a month after that, I started this (rehab) program. It's been 5 months and it's frustrating.

*2. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

I guess the hardest part is that I've gotten heavier. I'm too heavy. I've always been so active and I'm like, whose body is this? I've gained weight and I weigh 260 lbs now, a 25 lb weight gain. I'm going to wreck my other leg because I'm too heavy or something. And it's all this waiting. It has taken so long and I've gained all this weight because I couldn't be active, go out and shoot hoops, like I used to be. I'm always moving. I don't have to work out really, I'm just always moving and playing something. But right now, it's like I just do nothing. I can't seem to get anything going. I want to do it all or nothing.

*3. So what have you tried doing? What strategies have you tried? And are you happy with these?*

I tried using an elliptical but we have a new baby and I kinda lost it again. I'm off track. Can't seem to get back to my routine. My wife needs me to help and I have to drop things and just help. I've tried eating less, but you know, I just like to eat and I have always been able to eat lots.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Well, I guess the problem is, I'm not able to do things the way I usually do. Getting out and being active, naturally and just anytime. The elliptical is so random and halfway. And I can't do that so I do nothing. I guess what bothers me is the limitations. And I hate doing things half way. I'm 100% or nothing. I commit or nothing. I mean, I play baseball, but if I can't be there 100% then I don't want to do it at all. People depend on you, I don't want to let people down.

5. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

Well, if I can't commit 100% then I can't do anything. So then I do nothing. But people are depending on me, my wife and baby.

6. *So what is most important to you then?*

Being 100% committed to my wife and baby.

7. *And what are some strategies you could try to achieve that goal?*

I can commit in other ways. I can commit to doing the elliptical whenever it works out, commit to helping out, commit to not going to the gym because it takes time away, commit by eating healthy rather than trying to change the amount of food I eat.

Participant 8:

1. *Can you begin by describing your injury (when, how, what)?*

I was working in a kitchen and lifted a large box, I decided to let go, and it was across my body so it pulled by arm that way. I could tell right away it was hurt. I tried to shake it off but...that didn't work.

2. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

I'm not overly patient. It has taken quite a while.

3. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

My stretches and exercises, ice, heat. Some of the smaller stretches seem to help. It's hard to work through the pain. I try not to overdo it but sometimes you just can't help it. I try and focus on using my left hand a little more. Sometimes you sorta forget about it but the pain is always there. It is just annoying really.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

It's frightening to think how used to pain you can get. How you can just get used to the way your arm feels and start believing 'this is my life now.' But I know I just have to work through it and be conscious. I can feel it getting better so I'm not worried. The biggest barrier is that I coach kids' softball. I start tonight. I haven't actually thrown a ball yet. I'm going to ask my physio about that. I can try but not my normal power. I have to take it easy. I might have to just throw underhand. I've been in the league forever, one of the longest standing players in the league. I hate missing a season. I didn't even miss a year when I had my daughter.

5. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

You miss out on the exercise and the social part. I work really hard during practice. My daughter plays and now I coach. I want to give 100%, at least 100%.

6. *And what problems might that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

It doesn't even enter my mind that I wouldn't be able to. Now, an injury is different. But if I couldn't quite cut the mustard...I would have to try to play a different position so that it wouldn't be damaging to myself and my team.

6. *So what is most important to you then?*

Giving to the team.

7. *And what are some strategies you could try to achieve that goal?*

I would give more to the kids. It is just about as much a workout. More of a mental workout too. I have to think about it, and break things down for them. It is just natural for me and it is hard to break it down for them. It's not natural for them to play ball for 3 hours, like it is for me. I can play other sports like golf, but I love baseball. I can just get more involved in the league. I get self satisfaction from playing, but if I can't

get self satisfaction out of playing I can get satisfaction out of helping others play. Our league is excellent. It makes you feel good to know that people are having fun out there, that they don't want to leave.

Participant 9:

*1. Can you begin by describing your injury (when, how, what)?*

I have a shoulder strain. I did it at work moving a cart, a 6ft tall cart and went to deliver it, came out of the elevator pulling it towards me and the wheels got stuck in the track and the whole thing fell on top of me. I tried to hold it off, a natural reaction, and I heard my shoulder pop. So you try to shrug it off but it got progressively more sore. I've been off since then.

*2. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

Well I play sports and have had injuries so you just assume you will get through it, shrug it off, keep going. And obviously with a break or something major you wouldn't, but with something like this, you think it will just go away just like that. It's been frustrating. No social. No activities that you usually do. I play ice hockey. I did injure myself in hockey and I have problems from that with my neck, get headaches and it is compounded by the shoulder now.

*3. So what have you tried doing? What strategies have you tried? And are you happy with these?*

I do lots of walks and stuff but it's not the same. I have experience with injuries and knowing how to see them through, just adjusting.

*4. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

No. Not really. I did 9 weeks of physio and once you get to a point where you don't feel yourself improving anymore. It gets to that and you wonder why it isn't getting better. But you just switch it up a little and then you notice improvement again. And now, getting into here, that is the next step and I'm that much closer to getting back to work.

5. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

But it's frustrating because you can't do what you love to do. I would be out doing hockey, Thursday, Friday, Saturday, there's 3 games this weekend! But nothing.

6. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

It bugs me that I can't be out there being active. I enjoy that. I used to play a lot of other sports but I can't do them because of the neck injury. I'm limited with hockey too sometimes, and I do lots of walks. But mostly it's the not being as active, participating, feeling productive. I don't feel as productive when I'm not involved socially and actively. And I guess what bugs me about that is then I'm not learning.

7. *So what is most important to you then?*

The involvement, the learning.

8. *And what are some strategies you could try to achieve that goal?*

I could get out there and coach, coordinate, be part of the organization.

Participant 10: (barrier focused)

1. *Can you begin by describing your injury (when, how, what)?*

I was gardening, I'm a landscaper and gardener, and I went across this bridge, lost my balance and threw my back out.

2. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

It has been frustrating not being able to do what I love to do. There has been a lack of communication about what my options are. It's like I'm not a whole person because of my injury, because of my inability to work. I have two teenagers to support and I'm the sole provider. There's that stress and anxiety of 'what are my options.' I feel guilty asking. People don't tell you. I wouldn't have known about this place if I hadn't asked. I have to drive an hour to get here every day but it is really important to my recovery. The drive is huge for me to do because of my back and it's expensive. But I

found out that I could get compensated when talking with people here. I feel like I always have to seek it out. There is very little support.

3. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

Coming here. It is a great support network. They clearly define what is wrong and how to go about fixing it.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

The lack of support is really frustrating. I feel like I can't do it all alone. I have two children to support and I need emotional support, and there is none.

5. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

Without emotional support, I'm all alone. I feel like right now my kids are confused by my injury, like I can't be there for them. Without some support it is hard for me to pursue any other kind of job. I would love to teach art classes, it is something I can do, and I would love to go back to school, but I'm so stressed and depressed that I don't know where to start. I need that emotional support.

6. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

A lack of support does not allow me to pursue the goals I have or to help my kids be strong. It makes me feel all alone.

7. *So what is most important to you then?*

I need emotional support. I need that support in order to properly look after my kids. I want them to know me, but I can't do what I need to do right now without some support.

8. *And what are some strategies you could try to achieve that goal?*

I'll look into school. I'll seek that emotional support and keep fighting for funding...

Participant 11:

1. *Can you begin by describing your injury (when, how, what)?*

I am a merchandiser at a large retail store. The job involves a lot of climbing, lifting, so the injury occurred when I lifted a wet and heavy vacuum down a ladder. The ladders are like stairs and are 12 or 15 stairs. I am not very tall and I lifted above my head and then carry it down the ladder. It was too high and I twisted to get it out and down and around. The lower part of my back really hurt. I thought, I'll rest it over the weekend but on Monday it still hurt and I took robaxicet and then by Wednesday it was getting worse and I went to a chiropractor but the problem was disc so that probably made it worse. I called the company, and they said I should have reported it earlier. I modified my workload. But then I was lifting something else and that was it. I went to wash my face the next day and I wasn't getting back up. I started here doing physio, had an MRI, 2 cortisone shots and it will take a while for the rehab.

*2. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

Nothing really. I can't imagine being stuck. The only thing that is concerning me is whether I can continue doing what I was doing. I may have to make a change in work.

*3. So what have you tried doing? What strategies have you tried? And are you happy with these?*

I am pretty positive, I need to get it moving, but there is some progress. Range of motion and flexibility are still not there yet, but you have to start somewhere. I am also looking into getting into something more sedentary, marketing, selling... I was working on that anyhow, but now I know I can't continue with what I was doing physically, so I will have to find something else.

*4. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Nobody likes to have to admit that they can't do something. But I've had to realize that I can't do this job anymore. In many ways, this job was extremely physically demanding. I thought, well this is good because I am getting stronger and fitter. This injury is probably a good thing because now I have to look for something else. This is an opportunity. This injury has given me some time to work on redoing my resume and gaining clarity.

5. *And what problems has that barrier created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

It really doesn't bother me. Realizing that I definitely can't do this job has made me have to figure out what the injury actually was. Understand that it is worse than I thought. Once that is done, I can start planning, I can focus on how this is going to work. I've got my program. I have reinjured it slightly, I know that if that kind of thing happens it will be okay, I just have to be aware.

6. *So what is most important to you then?*

Awareness, clarity, understanding what I'm working with. Making sure I am doing what I want to be doing.

7. *And what are some strategies you could try to achieve that goal?*

I'm applying for other jobs. I'm making sure that I will be doing what I really want. I'm just going to work on this right now. It's going to take some work. I'm also going to go to an acupuncturist. I've heard that it will help with not only the injury but in stimulating the nerves in order to strengthen the area.

*Participant 12:*

1. *Can you begin by describing your injury (when, how, what)?*

I injured my arm, tennis elbow. I get pain through this part. I have had this injury for 6 years now and it happens from repetitive strain, using the keyboard and the mouse. Mostly it's the mouse. I make about 10,000 mouse movements a day because I am a draftsman, I draw maps. I've been a drafting tech for 28 years.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I have had many, many treatments. The last one was surgery. It has been 'successful' but there is still pain. I haven't gone back to work yet. We used to have those manual drafting tables, and then they gave us workstations but they just put the computers on the drafting tables, which really didn't work. We've had the computers since 1990. When I first got this injury, all that the company did was give me a little board to put my arm on. My family has been very supportive and I have had very good support all along from them.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The biggest problem has been the response that I got back from work. They wouldn't accommodate me, after 28 years and 6 years away from retirement. There's a real frustration with my employer. They set up a rehab consultant but she never followed through, and we would only have a meeting if I got ticked off. There would never be any follow through. My workload has increased significantly and I have been there a long time but I have had very little support.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

The lack of support has made me realize that I am not a valued employee, I'm a number. I'm one of the last of the 'lifers' but I don't get any respect for the time I have put in. The younger members think I don't know anything. It feels like my dedication to my job wasn't of any value.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

Their lack of value is a comment, a criticism on my character, my ability, my capacity to learn. They offer to train me but then don't follow through, they 'don't have time.'

6. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

There is a division between technical and drafting staff. I also feel like I can't interact with them. They rely on me but they don't acknowledge me. I'm very shocked by this. They come to the other side of 'the wall' when they need something. But I don't have the certificates. I don't think there will be a change. The manager is the same.

7. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

The division and lack of respect is a problem because I feel like I am worthless. They treat my job like it is less important. Drafting is just another 'file' for them. They don't see the inner workings.

8. *And what problem has that created for you? What concerns you about that?*  
(repeat until language shifts from negative to positive)

There is no respect for us. It is like we are not even human. I am human. I respect others. You have to respect who I am. Even as a woman, I could be like their mother or something...but they treat me like I am some 'bitchy woman, a common complainer.'

9. *And what problem has that created for you? What concerns you about that?*  
(repeat until language shifts from negative to positive)

It's offensive. I worry for other women. We will get the job done, and they know it will get done, yet there is no value associated to it. Now that I am injured, things are piling up, the emails are flying. Outside of my department I have good interactions. It is just within my department that it is a problem. They are asking when I am coming back.

10. *And what problem has that created for you? What concerns you about that?*  
(repeat until language shifts from negative to positive)

The lack of value makes me dread going back to work. It has become more and more a thing that I worry about. When I go back I am afraid that I will be judged even worse because there will be all this work on my desk that isn't done. Even though I haven't been here they will blame me for the work not getting done. I don't know what to do; I don't know how to cope. I talk with my husband at least, he used to work there.

11. *So what is most important to you then?*

I need to see people as people, they are perhaps frightened little boys in a way too. I am a human being too, I have accomplished a great deal. They can't take that away from me.

12. *And what are some strategies you could try to achieve that goal?*

I need to remind myself of what I am capable of, what I have accomplished, what I am as a person, and focus on that.

Participant 13:

1. *Can you begin by describing your injury (when, how, what)?*

I herniated a disc, a progressive injury while I was working with a painting company. I don't know the specific reasons but I think it is a combination of lifting a

heavy weight, twisting and posture and a difficult or compromising position. Your body starts to resent those postures.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I have been coming here, getting therapy and physio, being careful. I make an assessment first now and have become smarter.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The hardest part is losing confidence and freedom in your body's ability to move, bend, to do the things you have always taken for granted. There are delays in my decisions now in terms of my mobility. I don't move instinctively.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

The lack of freedom and confidence has made me aware of my restrictions. I am vulnerable. I have to realize that I have to care for my body and know my limits.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I am not sure if I can go back to do whatever job I want. I am limited. I may not be able to do a physically demanding job now. I have to think about training, what kinds of jobs I can do. I have language challenges to worry about already, now I must add the physical consideration. I have an additional stress.

6. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I realize it is a matter of time and this clinic is an excellent resource to recover my confidence and ability, but the added stress is a problem because it demands time and I have many roles to fill. These concerns impinge upon my abilities to fulfill my roles. I am having to put many of my goals on hold and with some of them, I have to start over.

7. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

Being interrupted causes a loss of income. I have to postpone my goal to buy my own home. I am turning 40. I am thinking of time. It affects my relationships. I'm angry and frustrated. I feel isolated, alone at home. That makes your mind work overtime. I try to distract myself and surround myself with positive people. Group sessions and sharing of ideas and insights is very powerful. We should get that support right away after surgery.

8. *And what problem has that created for you? What concerns you about that?*  
(repeat until language shifts from negative to positive)

The shift in my relationships has caused my role in the family to be impacted. We have had to re-accommodate. I felt useless. I felt like a failure. I play the role of figure head, with my coworkers I was the leader, socially I am a leader.

9. *And what problem has that created for you? What concerns you about that?*  
(repeat until language shifts from negative to positive)

If I am a failure, people may not think I am capable any more. I have lost power. Even though I might be better, they have no way of knowing that.

10. *And what problem has that created for you? What concerns you about that?*  
(repeat until language shifts from negative to positive)

If I am not seen as capable, then I need to find jobs I can do. I need to talk to my boss about what I can do. But what bothers me is that I will be limited, that I won't have opportunities. My ambitions and objectives will be hindered.

11. *So what is most important to you then?*

I need to evolve. What is in my power?

12. *And what are some strategies you could try to achieve that goal?*

I need to set new goals and ambitions. I want to work at a bank. I want to figure out ways to work that are not going to cause injury to me. I need to also be a leader in the workplace and that means taking the lead on safety. I will find new ways to do the work.

Participant 14:

1. *Can you begin by describing your injury (when, how, what)?*

I was in a car accident a long time ago that has affected my neck. This is the 3<sup>rd</sup> injury I have had. This time I hurt my back at work. The injury has led to a great deal of

pain, and I feel like I move 1 step forward and 2 steps back. I will get better but I need to be patient.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I have tried relaxation and meditation exercises as well as coming here now to this program.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

It seems impossible for me to continue in my present job. I feel like there is no way out. There is too much overtime and I have reinjured my back and neck several times now. I work with physically and mentally disabled adults and it is demanding. I love my job but it is too hard for me now.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

The problem is I am in love with my job. I love what I do and if I'm not there, maybe people won't see how wonderful these people are that I work with. I get them out. I do lots with them.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

If I'm not there, I'm not sure they will get the love they need. I love people. But right now I am not there for my daughter. And when I get injured I feel even more disconnected. We usually drive together and lately we haven't had that. I want to be there for her.

6. *So what is most important to you then?*

Being there for people.

7. *And what are some strategies you could try to achieve that goal?*

I need to upgrade my schooling. I don't care if I have to work at the same time, I know I have to do it even if it is challenging. I need to be strong so I can support my family and relationships.

Participant 15:

1. *Can you begin by describing your injury (when, how, what)?*

I hurt my kneecap at work. My company moved me around to smaller stocking jobs and I filed for insurance, then had surgery (arthoscopy). When I went back to work, it was more strenuous than before and my knee gave out. This time my kneecap was broken and more surgery was required. In recovery I was stocking shelves and was required to do illegal lifting again by my supervisor. He said, do it or get fired. I was fired for not doing it.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

So now I am fighting for my job due to 'wrongful dismissal'. The union is not very helpful, they want me to find all of the information and I don't know where to look.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The hardest part is that I may need new surgery with pins, pain, nerve damage. I feel like I am back to square one with my knee.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I don't even want my old job but if I don't fight for it, I will have nothing.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

And if I have nothing and need surgery I will be back to square one in that way too.

6. *So what is most important to you then?*

I feel like I need to see progress with my knee and work.

7. *And what are some strategies you could try to achieve that goal?*

I think I need to seek out retraining or just look for new work.

Participant 16:

1. *Can you begin by describing your injury (when, how, what)?*

My son and I were rear-ended and shot 40 ft up the road. My neck and back are injured and I have terrible pain. It has been 4 months and I don't have any relief from the pain. I am a mechanic so my job relies heavily on my neck and my ability to look up underneath cars.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I am doing rehab here and it works to a degree but not for the pain. I have 8 hours of pain a day. It pisses me off. How can I get through 5 more weeks?

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The hardest part is the pain. It just aches and aches. I can't get relief from it. It is totally consuming. It's all I can focus on sometimes.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

What bothers me most is how unfair it is. The accident wasn't even my fault. It is so unfair. I am innocent yet I have to suffer this pain and injury. I was doing so well, I am a recovering alcoholic and I have been sober for 10 months now.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I guess the problem is that it has impacted all the things that I love like playing ball. I am so active in ball and it has really seen me through. I feel like I can't even go watch in case the insurance agency thinks I am faking. Yet I know that if I could go get involved, it would take my mind off the pain. I feel caught in a trap.

6. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

It is hard to get through the pain and to stay positive. I need to be involved and do something. I can't just sit around.

7. *So what is most important to you then?*

Being involved. I know I can do this because I can get through anything one day at a time, I learned that in AA.

8. *And what are some strategies you could try to achieve that goal?*

I have to just take it a day at a time and find something important to me. Maybe I could coach.

Participant 17:

1. *Can you begin by describing your injury (when, how, what)?*

I am a custodian and I swung a bag of garbage over my shoulder and it just kept going.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

Well it took much poking and prodding but I finally got in here. I had a limited number of visits to the health professionals and then it took a long time but I got into this program.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The time it took. I felt abandoned and neglected by the health system. It is the insurer's mandate to help people but they only go so far. When you 'should be better' the help stops even if you aren't better yet. It actually drags out the whole process and doesn't make sense.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

The time is frustrating because it was 4 months when I didn't see my grandkids like I usually do, 4months of my life was wasted, no golfing with my buddies, I couldn't even help with groceries. I have a life to live, I don't want to be here. It made me depressed and that probably made things worse too.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I started to feel inadequate and a lack of joy. I missed out on my grandchildren, watching them sing, and dance, and grow. The problem with that is I then lost that joy.

The joy I get from knowing I did a good job as a father, with their mom. When I don't have that, I lose my sense of self, my purpose. I lose them and they lose me.

6. *So what is most important to you then?*

I have to build my sense of self, I have to sustain faith in myself.

7. *And what are some strategies you could try to achieve that goal?*

I can still watch my grandkids, and I have to surround myself with good people, remind myself of who I am and what I do, my daughter, wife, buddy, kids, grandkids...

Participant 18:

1. *Can you begin by describing your injury (when, how, what)?*

I hurt my shoulder and neck at work stocking shelves. I was lifting many mirrors at once. I felt my shoulder pop on the eight one but I was embarrassed and kept working.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I tried a pattern of working 4 hours at a time for many days. If I went longer that seemed to make it worse. It seemed like short term gain for long term pain.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The hardest part is when people don't believe my pain. My case worker, boss, even fellow workers seem to doubt my pain. The trouble is I can work through it but then I can't work at all.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I feel like I spend hours on the phone, writing, digging for information to justify myself and others of my injury. I go between doubting myself and defending myself. When they doubt me, I doubt me. And then I try to work harder which makes them doubt me even more!! That comes from growing up with my uncle and abiding by the 'go to school even when you are dying' mentality.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

This adds stress and then increases the pain. It takes away from my rehab because I have to spend so much time on the phone and dealing with people who are questioning me. It's not true and then I get upset and want to fight it. I care what others think. I spend my time arguing for myself rather than simply getting better.

6. *So what is most important to you then?*

What is most important is attending to rather than defending the injury.

7. *And what are some strategies you could try to achieve that goal?*

I need to do productive things that will promote my healing and do the bare minimum to ensure I have the financial support I need. Even if the support stops, I can get by and it is most important that I get better.

Participant 19:

1. *Can you begin by describing your injury (when, how, what)?*

I was injured while lifting garbage cans during a big snowstorm. I am a sanitation worker and we couldn't use the transportive carts to carry the trash because the snow packed into the wheels making them inoperable, so we used our arms to just carry the cans the old fashioned way. The combined strain of pulling on the cans, lifting them upside down, and flipping them into the truck caused serious tendonitis in my wrist.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I can't 'not do it' when I am working without wreaking havoc throughout the district program, without having to then do a lot of paperwork, upsetting my employer who has a reputation to uphold. We 'work through it' and 'always have!'. I'd have to engage the safety officer as well and she is 'a piece of work' and very judgmental. That's my only choice. Now I'm off work and coming here for some therapy. You just have to accept it, you can't do a thing. I've had lots of injuries, I can get through it. I know what to do, I can handle it.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The main frustration is having to deal with the insurer. All I can do is accept it. There's no point stressing. But the problem is you have to fight to get an answer and to get treatment. There is a double standard because they expect you to answer their calls but they don't answer yours. I went into their office in person though and then I got accepted into this program.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

The problem is that the insurer doesn't seem to be in it for the workers. I had to wait an inordinate amount of time. They are screwing the wrong guy, I'm motivated to return to work.

*And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

Having to wait like this is frustrating because I was off work doing nothing. Living like that was hard because it goes against my values. I like to be a contributor, not a leech.

5. *So what is most important to you then?*

Being a contributor.

6. *And what are some strategies you could try to achieve that goal?*

I couldn't control the injury or the insurer so I just made the best of it, had to see the positive. I read books, lots of books. I played with the kids, watched hockey. Also, I see all sorts of things that need solutions. The wheels on the carts don't work in the snow, the safety officer has all sorts of proper lifting techniques in her information but there isn't any training program in place or anyone to help us learn these techniques, only a manual. And who knows where that is? Also there has to be a number of techniques because every can is difficult and every situation is unique. But they don't want to hear it, so I don't say anything...

Participant 20:

1. *Can you begin by describing your injury (when, how, what)?*

I slipped on grease on a restaurant floor. I was carrying a large tray of cutlery because I am a busser or dishwasher. I injured my back pretty severely when I landed ‘wham!’

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

This is my third injury there. I hurt my shoulder when carrying heavy grease pails and I got 3<sup>rd</sup> degree burns when hot tea was spilled all over me. In all of these situations, I still worked shifts. I just work through it.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most ‘stuck’ or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The hardest thing is facing my boss when I tell him I want to quit. He is under stress because he has other health claims against him, He is losing money, 4 other people have quit because of the unsafe working conditions. He might ‘freak out’ or ‘rag’ on her. If he has had his coffee and smoke, he’ll be fine though so one can’t know.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Yeah, the hardest is not knowing how he will react. I don’t know if he will lose it on me. I wish I could bring my whole family with me but I can’t. They all want me to quit because they know it isn’t a safe place to work.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

It’s the unpredictability. It scares me. I don’t know what to do when he gets like that and I don’t want to give in, I really need to quit and not work there anymore. I really hate that I can’t be there for my frail foster mother. She needs me to help her get around.

6. *So what is most important to you then?*

My family. I want to have the strength to quit so I can be there for them.

7. *And what are some strategies you could try to achieve that goal?*

If he starts yelling I can just walk out. I could even have my foster mom in the parking lot, she is like Judge Judy! I’ll just take the summer off and look for another job closer to my house. I like to garden...

Participant 21:

1. *Can you begin by describing your injury (when, how, what)?*

I was working in a deli and bending over with my head in the display case, moving heavy boxes of seafood. I don't even like seafood. I ended up in this place because I thought I wanted to work with food and with people. But it is a really hard job, lots of reaching and bending and heavy lifting, and it isn't very ergonomically correct.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

Well, I thought I was getting stronger. My back was just aching every night, this fire in my back, but I thought, it will get better, I will get stronger. But really, it never did and then finally it went. I was misdiagnosed and that delayed treatment. I went for physio etc. but it wasn't getting better. They thought it was the spine but it was muscular. I should have been in this kind of program a lot earlier.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

Well, it took a lot longer than it should have. And I had to defend myself constantly with the insurance provider.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Having to constantly defend myself made me feel like a puppet on a string. Like I was being judged as someone who takes advantage of the system. I had no control.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I wasn't getting better, nobody was helping, I felt like I was doubted constantly. I didn't want to be with anyone because I was in such pain and was such a burden and I think that made me worse. I was alone and had too much time to think. I really started to feel low self worth. It was like it had a hold over me. I actually became suicidal.

6. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

Well, if I'm suicidal and removed from my life, that's horrible. I mean, I need to be there for my daughter. And that was hard too, I felt like I couldn't really be there for my daughter during this whole thing. It was killing me.

7. *So what is most important to you then?*

I need to support my daughter.

8. *And what are some strategies you could try to achieve that goal?*

I am going to get better. I'm working hard here in this program and I am going to find a job that I love doing what I love so that I can be there in body and spirit for my daughter. It's not just about money. This was so useful, you need to do this earlier. It gave me a chance to reframe, to reorganize my thoughts and gain confidence again.

Participant 22:

1. *Can you begin by describing your injury (when, how, what)?*

I hurt my knee stepping off of a platform while loading some luggage at the airport. I work for an airline.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I went to my doctor and had to wait to see the insurance doctor. I went for x-rays and then went for an MRI. They gave me a brace. All of this took months. Then I went to physio but that was limited to 21 visits. I was improving but hit a plateau. I knew that the brace helped a little, I could do my job, but when I got home the pain had increased and then I couldn't work the next day. It wasn't getting better, I was just getting through the day. Then I went for a molded brace. That helped too, but again, it didn't help it to get better. I knew all along that it wasn't working and probably we could have cut months off of the process if we had just gone for the surgery right away. It took a long time to get hold of the specialist too. I can feel that it is getting better now, it is just a matter of time. There isn't the pain like before and the mobility is coming with treatment in this program.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The time. I really want to get back to work. I hate not working, sitting around. But you know you think that they know what they are doing. I can see now that the breakdown was between my doctor and the insurance specialist. There was a contradiction in information and limited communication. I guess I just assumed they were doing their best and I don't have much experience in this so...

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Well, it took months when it could have been weeks.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

It is frustrating because I knew. I knew that the other stuff wasn't working. I should have pushed harder and I would have taken months off the process. But I was never really asked either. I never voiced my concerns or my intuition because it never occurred to me and I was never asked how it felt or what I thought in terms of whether it was getting any better.

6. *So what is most important to you then?*

The opportunity to say what I thought and be heard earlier to save time.

7. *And what are some strategies you could try to achieve that goal?*

Well I recommend that the insurer's doctor take into account the client's gut feelings about an injury. They should ask or workers should be encouraged to state their observations and experiences.

Participant 23:

1. *Can you begin by describing your injury (when, how, what)?*

I injured my arm (tennis elbow) retraining for my job. I work for a hospital and they were restructuring. They were trying to equalize various levels of clerical jobs and we all had to go through an 'upgrading' in order to receive the new wages. I needed 50wpm typing so I started to train for it and did 6 hours of typing per week. I started to get the elbow injury and it got worse and worse. I started dropping things at work but there was a pressure to continue because I could only do 36 wpm and I would be displaced by Feb. 14 if I didn't upgrade my typing speed by then.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

A friend could do massage and ultrasound and work tried an 'ergonomic change' in my office area but that was useless. I had 2 cortisone shots but they didn't work. I have been denied long term disability or insurance because I am not a surgical candidate and the specialist denied me an MRI because of that. I've been able to finally get long term disability and medical unemployment insurance and I finally stood outside the door of an operating room and asked the specialist if he could operate. It took months but I had it done and now I am in a work hardening program.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The hardest part has been the time it has all taken. 2 years. Also the stress of having to fight for benefits while fighting for my job at the same time. I get headaches and strain in my neck and shoulder as well now. I feel dependent on others for information and I hate that. I am now displaced from my job because I couldn't get my typing speed up. I know now it will only be one more month and I can taste it. I know there are other opportunities to apply for and in some ways this is a good thing because I can pursue a different type of job.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

The biggest challenge will be finding a new job. Finding something I like.

5. *So what is most important to you then?*

I really need to focus on doing a job that I'm good at, that doesn't need typing necessarily. One that I can use my skills at.

6. *And what are some strategies you could try to achieve that goal?*

I'm good at being independent, I'm a good leader, I am very structured and organized. I can think of lots of examples at work and here at the clinic where I have been asked to take on leadership roles. I see this as an opportunity.

Participant 24:

1. *Can you begin by describing your injury (when, how, what)?*

I injured my wrist doing heavy lifting as a deli worker. I have had multiple overuse injuries while I worked as a CSW caring for the brain injured. I had misunderstood the job posting for this work thinking as an assistant manager that I would be able to avoid too many physical demands, but in the end the job was primarily physical. I feared for my own safety and the safety of others because, with this injury, there were times when I almost dropped scalding hot items because they were too heavy. With the fear came increased pain and severity of the injury.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I think I need to do retraining. I need to do something with people because I love people, but something that doesn't involve heavy lifting. I love the people interaction but maybe something simple like data entry. Still it seems like a waste because I got my degree in social work. It seems like a waste. I got my degree to avoid the physical manual labour kind of jobs, and in the end, that is what caused me to have to go back to more manual labour.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The main frustration is with my job or position. I went to school to get a better career and I am back where I started. It's frustrating because it seems like a waste. I always try to better myself and I know I can do it, but I'm not sure it is worth it or as important as people say it is.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I always felt like 'just a waitress' so I got a degree and I was proud of myself. I proved I could do it. But then the injuries put me back into the position of 'just' a deli worker. Things are beyond my control, I had to take that job, I don't want to go on welfare, I had no choices. But what bothers me is this attitude that I have to 'defend' what I do. I don't really want to have to prove myself all the time. Why?

5. *And what problem has that created for you? What concerns you about that?*  
(repeat until language shifts from negative to positive)

What bothers me is the 'stigma', it lowers my self esteem. I start to believe it and I get depressed, suicidal, I feel worthless like I'm not making any real contributions. When I do prove myself I end up stuck in the same place anyway and feeling the same 'stigmatization.' I feel like I'm too busy proving myself and my real strengths aren't even being recognized. I have a lot to offer.

6. *So what is most important to you then?*

I need to show what I can offer, not prove that I'm good enough. I am good enough. My real goal is to show my strengths. I love people and I really want to work with the disabled because they have a lot to offer too. I want to help people understand this.

7. *And what are some strategies you could try to achieve that goal?*

I dream of opening a restaurant "Rock Soup Café" and I know there is support, grants, her band, the Native Friendship Ctr., aboriginal grants, family, and I can apply for that. I know I can learn and find that information (somewhere in this discussion, she stopped icing her wrist and began to use her arm with animation to describe her plans).

Participant 25:

1. *Can you begin by describing your injury (when, how, what)?*

I am a tour guide and I was staying at a hotel in Vancouver. It had been a long day and I was quite tired. I had placed several laminated sheets that I use on the tour on the floor. When I came out of the bathroom I stepped on them and slipped. I broke my femur in the process. I couldn't get to the door, I started yelling but nobody heard me, I couldn't reach the phone because I couldn't move. I tried to calm down, and I finally thought of my cell phone which I could just reach from my bag on the floor. I called 911 and they had to break the door down because it had that locking mechanism in place. I had had other injuries on tour as well. Once, at the same hotel, I got caught in a curtain as I entered a dining room and broke my kneecap. I have wires in it and it still gives me pain. I did not receive a settlement for that because insurance covered it as an employee. I was really scared. I worried that I wouldn't be found until morning. I thought of throwing

things through the window but even that I couldn't do because I was stuck on the floor. I just tried to stay calm so I could think. I knew if I screamed I would panic and I needed clear thinking.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I told the bus driver everything he needed to know for the morning. I've begun this program and I can feel myself getting better.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The biggest problem is my fear. I am afraid that as I get older I will get more tired and will be more susceptible to falling. I would love to not work, the doctor agrees, but I need the money, I'm not ready to retire. But I'm worried about the fatigue, it gets in the way of clear thinking and then accidents happen. I'm not sure I can continue at the pace I have been working at.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Every time I have a fall, I have to go under anaesthetic. I worry about that too. I worry that it has an effect on my brain, that it will inhibit my thinking, bring on dementia as I get older.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I have always had to rely on my clear thinking. I have always been good at it, a quick thinker. It got me out of all sorts of predicaments as a child. My sister and I were abused at a boarding school and I used my mind to rebel and to survive there. I also got out of difficult predatory situations as a young girl by using my brain. I have thought of doing something more with my brain, but I also have a fear of failure. I want to teach courses in how to be a tour guide. I have it all set up with the rec centre, but I'm afraid I can't pull it all together.

6. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

If I can't pull it all together, then it won't be good. It needs to be a good course. I know I am a hard worker, and I have it all laid out, but it needs focus and direction.

7. *So what is most important to you then?*

So what I need are focus and direction.

8. *And what are some strategies you could try to achieve that goal?*

I can get that by going to the retraining program offered through my insurer. They will help me build my business with more focus and direction. That will help me to pull it all together.

Participant 26:

1. *Can you begin by describing your injury (when, how, what)?*

I am an RN on the psychology ward of the hospital. My injury happened when I was working with one patient in particular. He had a series of complications and we didn't realize the withdrawal he was going through. After a great deal of physical labour working with him, he then completely gave out on us physically as we were trying to get him to emergency. The problem was that he wasn't an emergency case so it took a long time before we could get him admitted and by then he had completely shut down so it was even more of a physical strain to carry him into that area. The security guys were helping but I was bearing a great deal of his weight when he suddenly went limp and I took the full brunt of it in my back. I have sacroiliacitis and I discovered that I also have an abnormality of the spine.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

I had MRI's and I have had 3 epidurals in the spine under x-ray. That should help but I'm not sure for how long. It has helped. The first one didn't but the next two did. They decided after the first one to change the position of the injections to target the facette joints as well. I still have numbness in my legs, I can't sit, lie, stand for long and definitely can't do 12 hour shifts. I came to this programme which has been tremendous. The goal is to be healthy and it is a holistic experience.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The numbness is a problem. It is disorienting in the shower, I feel unstable and like I could fall.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

If I can't be quick, there are implications at work. Things will get backlogged. There are implications for safety then as the room fills up with 22+ people and then security is an issue and more work is created. We could have them all night then and that has its issues of course.

5. *So what is most important to you then?*

I need to feel my feet.

6. *And what are some strategies you could try to achieve that goal?*

I have to make sure I get better 100% before risking going back. I can't do modified work in that environment. It is all or nothing. But there are other problems...

7. *What else has been a frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

I am also struggling with the fact that people don't believe my pain. I can handle it, I'm assertive, but my energy is misplaced. They think, well she had this spinal abnormality all her life and there was never a problem before...

8. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Well, it's not true. I know there are people who misuse the system. But I am the system. I've been a head nurse 3 times.

9. *So what is most important to you then?*

To know that the people I respect trust me.

10. *And what are some strategies you could try to achieve that goal?*

I know my bosses trust me. They have been very supportive and understanding. That is all that matters. There are other problems...

*11. What else has been a frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

I worry that the pain will return. It is very debilitating. I can't play with the grandchildren the same way, I have to sit down before I can hold them, my whole way of life is affected. I am not as involved in my church. I can't get out to the meetings or sit in on the meetings and that is my support system.

*12. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I just want to make a contribution, I want to give to those I love.

I worry that I'm becoming separate and isolated. That I'm losing my support system.

*13. So what is most important to you then?*

I really value that connection.

*14. And what are some strategies you could try to achieve that goal?*

I need to reach out more in other ways, on the phone, I can do other things for the church that don't involve sitting in meetings. But I still worry about the injury and whether it will improve.

*15. What else has been a frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

I worry that the pain will return. And that it may not be covered again.

*16. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I'm afraid I will have to sell the house. I'm not ready.

*17. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

All those roots, all the memories. My husband can't help me, he has so many health problems right now, and we have been helping my son with custody battles so we have remortgaged. I can't let the house go though, all those joys and sorrows, all those memories.

*18. What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I guess what bothers me most is that someone else will make the decision. I want to make the decision not have it made for me. I feel so out of control. And I know I can't do anything about our situation or whether the pain returns. What really bothers me is this feeling of powerlessness.

*19. So what is most important to you then?*

I need to feel some sort of power or control.

*20. And what are some strategies you could try to achieve that goal?*

I get a great deal of power from my support system. My work, here at the clinic, my bosses, my kids, my husband who is wonderful, my family, my grandchildren, my church, my friends... I'll just have to reach out more and get my strength from them. One thing I am good at is knowing how to find resources, how to reach out.

Participant 27:

*1. Can you begin by describing your injury (when, how, what)?*

I was working at a retail store and had to move a roto-tiller. I hurt my shoulder. My boss said that I had to do it or else. He then wanted me to finish my shift after I injured my shoulder.

*2. So what have you tried doing? What strategies have you tried? And are you happy with these?*

I tried physio and then the sessions ran out. They wouldn't let me do more and they wanted me back at work. So I plowed through it. It just got worse and then I came to this program. I've been doing physio for 8 months but I don't see it really working. There are flare-ups.

*3. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

Losing what I was like. How I could just do things without thinking. I feel like the injury is controlling me. I can't do simple things, tiny things, I have to think about

everything, I have to take steps and everything is a huge process. It has taken over, made everything into this process.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I miss being out going, the dogs, the family time, my relationship. I can't do anything without pain or without threatening a re injury. I feel like all I can do is go get the mail. But even that is a process. It is painful and I have to really think about every single little step.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I don't do anything. I don't see anyone. I don't want the focus to be on me so I don't bother calling people. I don't want to go to Australia to see my mom because she'll worry, she'll focus on me and my injury. I don't want that.

6. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

When the focus is on me, and on everything I do, I feel like I've lost me. I can't just be comfortable, easy, natural, without thinking.

7. *So what is most important to you then?*

The simple life. What I was, what I had. Just the little things. Doing the little things. It's what I do and what I have. When I came here from Australia, it was something I had: the little things, just living my life naturally and easily. I'm going to have a good cry now.

8. *And what are some strategies you could try to achieve that goal?*

I am still me. I'm still natural and easy going. I still take joy in the little things. Even with the injury, I can find little things to enjoy.

Participant 28:

1. *Can you begin by describing your injury (when, how, what)?*

I was in a car accident. I was in one when I was a kid and my best friend died. I lived. I had to deal with that for a few years. So I know what it is like to come out of these lucky situations. These injuries aren't as visible. I should have died, if my truck had

flipped over once more I would have. I hit black ice and the truck flipped 5 or 6 times down a 250ft embankment. I came out alive, grabbed my briefcase and my laptop and hiked up the bank to the highway. Amazing.

2. *So what have you tried doing? What strategies have you tried? And are you happy with these?*

It is mostly my neck and back this time. I'm still pretty sore and stiff but this program is helping. In a lot of ways, not just physical. The first crash, I was very beat up. I had broken bones, hundreds of stitches. I know what it is like to recover from injuries. It takes patience and positive attitude.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

The hardest thing is not being able to do what I have always been able to do. My injuries aren't visible and that's hard to explain. It will also be about redeveloping how I go about sports, and the daily processes of my life.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Well, I know it is a process. I know it takes patience. I've been there. I'm ready and I know what is involved. It takes time and you have to stay positive.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I really want to get back to work. I hate sitting around. And everyone is wondering, you know, when I'll be back. My injuries aren't visible, they are internal so that is hard to explain, but I know I have to fully recover before I go back, so that I'm confident and I do a good job. It's really about being there for the kids. It's all about family, the kids. I have to make sure I'm doing my best, I have such a short time with them really. It's hard to stay positive but this place is good for that, reassuring, supportive, confidence building. And you need to be positive through this.

6. *So what is most important to you then?*

It's really all about family, the people I love, the kids. I have to be my best for them and that means getting back to myself, my confidence. I want to build my memory in their hearts and minds and that means I have to be positive and all there.

*7. And what are some strategies you could try to achieve that goal?*

I'll come here and stay focused. I have to be patient and know that it will take time, but I have to take that time in order to be there 100%. It helps to be here, it's reassuring and it keeps you positive.

*Participant 29:*

*1. Can you begin by describing your injury (when, how, what)?*

Using a jackhammer, I was on an elevation and when it broke through the concrete it pulled me down, and it also got stuck so when I tried to pull it free I felt something tear in my back and I literally dropped to my knees. I was crying in front of my foreman, in front of everyone on the job site it was that intense. An MRI shows muscle and tendon damage, a back sprain, which I guess can take longer than disc herniation.

*2. So what have you tried doing? What strategies have you tried? And are you happy with these?*

I went to the doctors, had x-rays, have been to physio ever since. They say I should be able to recover. It was intense pain, I've never felt anything like that before. Maybe I could have had a better stance. Maybe I could have gotten someone else to do it (laughing). Maybe I should do another job, I have to avoid jackhammering. I can't do that anymore. I want to be foreman, so I don't know what will happen. It's comfortable here, it's a good workout, it feels sore but a good sore.

*3. What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

I'm worried about re-injury. And I just don't know, I've never been injured before. I don't think my back can handle returning to full labour right now. I just don't want to get that injury again. Not sure what I want to go back to. I've learned so much lately, about my back, about pain, about what I can do and can't do. I'm worried that I've been working so hard, I've been missing out on other things.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

There is, but nothing that really affects me greatly, just tedious little things. But really the only thing that worries me is finances. I think a lot about it. It's the only thing that has really affected the way I live. It's the only thing I really worry about, on insurance you don't get what you normally get.

5. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I hate money. I hate it. It feels like it is all I have basically thought about for the last three years. I'd rather be thinking about something else. What I'll be doing tomorrow...I'd rather not think about money, whether I'll have enough money for food, for rent, whatever. I realize that it's my own fault but...

6. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

It distracts me from sleeping, from working, from exercising. It takes over my thinking. When I go to bed, I think about it a lot. My mind is always wandering, and it gets to thinking about money. I push things to the limit and it is finally catching up and now it's all I think about. I should be sleeping, I'm supposed be thinking about sleeping.

7. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

Stress. Fatigue. It's a big cycle. It feels like I'm not going to get out, I feel stuck, and then it branches off into a million thoughts and worries, like a tree. It becomes way overwhelming. And at night it's always worse, alone, without anything or anyone else to slow my imagination down. It makes me feel sick. It makes me feel like I'm the cause of my own problems. I shoulda, woulda, coulda...negative energy. And the problem with that is you're not going to stop thinking negatively, it makes you feel like you are never going to get out of that rut. It distracts you from the things you want to do, like going to Mexico!

8. *So what is most important to you then?*

I feel wicked right now. It feels good to talk about things. You can't talk about things like this with just anyone. That's where my parents kick in. I love my parents. They're

awesome. I owe them everything. Straight facts. I want to get back to Mexico, where I had no worries, no stress.

*9. And what are some strategies you could try to achieve that goal?*

Goals. I have to set goals. I'm a hard worker and I can do a good job. I've never been fired. At the airport, I was a crew chief within a year, I'm meant to lead. I need to learn money management, I can talk to my roommate about that. I've talked to the banks and life insurance to take care of some financial concerns. I need to get stronger physically and I can keep working hard here but I can also go to the gym when I'm back at work. I can connect with my friends at work who also go to the gym so I have some support, and I'll go right after work because it is 2 minutes walk. I need to get stronger mentally too; I can work on being strong here, I can learn more, pay attention more to my back and how I move. I need to be mentally strong enough to know when to quit, when to stop. I can look up some online courses as well for my math. I can learn from my boss, he is my mentor. I can also work on finding a new position at work. I want to run an excavator instead of doing the hard labour. I want to be awake when I get home, not be so tired, I want more balance. I also want to travel and get back to my scuba diving and that will come.

*Participant 30:*

*1. Can you begin by describing your injury (when, how, what)?*

I was rear ended in a car accident and then ran into a woman who had run a stop sign within 8 months of one another. My back is really hurt still, upper and lower. It's hard to know what is from what now. It's frustrating because they weren't my fault and I felt like the drivers were really irresponsible. It felt really unfair.

*2. So what have you tried doing? What strategies have you tried? And are you happy with these?*

I've been coming here and I'm on light duty at work. I have adjusted my hobbies and I have come up with some solutions for sleeping because I was having some real trouble there. I went off coffee completely. I have been doing physio and working out here as well. It's weird; it's very migratory so it is hard to understand. I have scoliosis and that

might be aggravating as well. I've had headaches. I'm just trying to understand it all, piece it all together. Just noticing more how my body moves.

3. *What has been the biggest frustration, concern, or barrier for you during this experience? In what way have you felt most 'stuck' or dissatisfied with your strategies? Is there something that is bothering you in particular with relation to your injury?*

Really, it's not being able to do what I usually do. I'm really creative and I'm independent. I work on cars and I love my job. I'm an artist too. I feel like I can't do any of the things I love. I've lost quality of life. I have had to move back into my parents and everything I had and did has changed really. It has all slid backwards. I feel a real loss. I'm really at a loss about my car too. That was my baby. I know it is just this material thing, just a car, but it is like when you lose a loved one, I guess I'm grieving.

4. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

Well, if my car is gone, it really bothers me because of all that I have invested in it. All that it represents. I feel like I've lost so much of what I do and love. I've lost the joy. It's a creative outlet, working on cars and painting and working. I feel like it is physical, mental, creative and I can't do much of that anymore. I feel unfulfilled. I mean, how am I going to pick myself up after a bad day?

5. *What bothers you most about (this barrier)? What concerns you, worries you? What problems has it created for you?*

I guess the fact that I've lost so much control. I can't make decisions and that is what makes me an individual. It's the whole equation, it's me in relationship with the things I love. It's me I've lost. Self expression.

6. *And what problem has that created for you? What concerns you about that? (repeat until language shifts from negative to positive)*

I'm still me, but I feel like I'm missing part of the equation. It feels like I disappear. I feel like when I'm not complete, in relationship, fulfilled, that I'm not able to be fully me, to be a positive force, helping other people and being a pick me up for others.

7. *So what is most important to you then?*

I want to be me. I need to fulfill all of those parts of me so I can be more of a positive force in life. I want to brighten someone else's day, try to build someone else up.

8. *And what are some strategies you could try to achieve that goal?*

I need to focus on others. I need to find other creative things to do. Focusing on making sure I can do things, not overdoing things. I can paint smaller canvases and put them together into a larger piece. I can work on my car without it being physically demanding by going to a friend's and power washing or working on smaller parts. I could get a motorcycle so it is more manageable. I'm working, not doing the amount or level I normally do, but I'm still doing a great job which is what is most important.

## Appendix F: Qualitative Tables Experiment 1 and 2

### Solution Readiness and Problem Strategies

| <b>READINESS</b>                                                                                   |                                                                                           |                                                                                          |                                                                                                            |                                                                                                                                |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Gets solution but not problem</b>                                                               | <b>Intuitive</b>                                                                          | <b>Sees failure and solution</b>                                                         | <b>Sees problem and solution</b>                                                                           | <b>Sees problem but cannot get solution</b>                                                                                    |
| got impasse but not solution                                                                       | saw it right away                                                                         | 4x4 is impossible!, spaces!                                                              | right away got two middle pieces, circle, then '2 shapes'                                                  | about making angles to tighten the clamp is problem, tightened with hands, sideways screw, more time???                        |
| diag, had it but then went back to box                                                             | emerged without realizing                                                                 | had to fail to see it, explored                                                          | where do YOU go?" (big one in cross)                                                                       | the problem is too many cards, how can I make them all fit? The other problem is that I can't see it any other way.            |
| abandoned 3/4 circle, 'I've never been faced with this!' 'It could be two circles... or maybe not' | saw the right angle first'                                                                | started venn diag, that won't work, played in air above paper                            | some way to tighten it up                                                                                  | the problem is too many sticks!                                                                                                |
| shared' but no solution put queen below but didn't see possibilities                               | reminder of goal, instinctively pulled, tentative but saw that it was working             | moved 2 up to make space but didn't see, then 'realized it couldn't be a 3x3 grid...'    | obviously I'll have to leave blank spaces, always comes down to this one card,                             | diff shape...                                                                                                                  |
| had it, cards off of corners, but didn't see 'column' with big space between 2 cards               | shared immediately, then stacked                                                          | drew square, tried upper corner, remembers other principles from other problems, failure | cbc emblem, I'll just start, (part circle) wait that's too small, could it be 2?                           | compartments'                                                                                                                  |
| had half a circle but didn't see it                                                                | laid it down on table, lifted fixture to provide leverage, screwed it in with screwdriver | tried connecting first, then saw crux and used pieces as meant to be used                | stared, sideways screw, 'still going to meet'                                                              | shared but not beyond                                                                                                          |
| shared right away, tried clearing it off                                                           | saw immediately                                                                           | tried to tighten together, used holed,                                                   | tested size first, looked at pieces thoroughly, sideways screw still, brought clamp together with hands... | started filling in right angle, I have to be economical, missing pieces, stuck with that rough edge (at bottom or large piece) |
| methodical, worked on right pattern too                                                            | spread out                                                                                |                                                                                          | too loose', hooked, realized not small enough, turned around, 'sewing experience'                          | 2 a side?' fold? Not enough coins.                                                                                             |
| stacked but lost it                                                                                | layed down box,                                                                           |                                                                                          |                                                                                                            | felt bolt, pulled but wouldn't follow through, layed box down and pulled up, but couldn't tighten all the way                  |

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| <p>at first</p> <p>fit two pieces but didn't see filled end, drew it, had it on angle but didn't see it</p> <p>in box, some out, column with empty space, still didn't see</p> <p>wasn't able to see, even when matched, wouldn't try much, tentative</p> <p>kept coming back to box, couldn't see gaps even when extending outward</p> <p>saw holes, then saw failures, couldn't go beyond</p> <p>diag, very close (1 card away!), lost it, couldn't make it work, didn't actually have insight, cleared and started over</p> <p>changed to minus but lost it</p> <p>left one red, diag, lost it</p> <p>made circle, didn't see at first</p> <p>wouldn't use previous strategy II=II=</p> | <p>levered screw</p> <p>saw it immediately</p> <p>got half circle right away, abandoned, kept doing, finally saw it, seemed surprised when it was done</p> <p>diag, spread out</p> <p>looked, saw circles</p> <p>turned big piece on angle right away, 'thought this was meant to trick you (corner space in large piece)</p> <p>stared, then did it</p> <p>closed eyes, covered sticks at bottom, 'oh! That is what I am assuming!'</p> <p>filled angle, kept picture in mind, lucky/random</p> | <p>diag, had it but wanted to 'squish them in' then asked 'spaces?'</p> <p>quickly sees failure and lets go of that avenue</p> <p>can't move it 'how do you not move one?' 'reverse to make 2nd one look like 1st?'</p> <p>I have only this?</p> <p>2 per side, then stacked, 12/2, 'no other way'</p> <p>knew it wouldn't work to just use 2 square spaces</p> <p>assume it's one, connected...</p> | <p>figured it out</p> <p>6 sides, 12 quarters, 4 quarters each side', had it after 30 seconds but forgot one corner and did not see it, then came back and tried it again...</p> <p>redrew 'what is different' (middle 4 sticks), 'that's impossible', well I'll have to share...</p> <p>filled right angle, put big piece on angle, 'maybe if I turn it sideways'</p> <p>held metal, wanted to go inside, wanted to hold nut inside.</p> <p>shared 'missing a couple' picked up, shared 3, stacked</p> <p>hooked, asked about reversing around the cylinder across the hole, screw vertical, took apart to screw together using square piece instead of screw, then 'duh!'</p> <p>measured, round, sanded sides, not meant to fit together, looked carefully, perimeter, 3/4 circle</p> <p>started with corner, then needed to cut out a line somehow</p> <p>cinched, put washer on other side and cinch, hooked, looked at screw, saw the way it worked</p> | <p>I need square ends somehow</p> <p>spread out, diag, 'no holes?' assumption, still couldn't let go of box</p> <p>shared right away, then stuck on 3 a side, 'must share, but not enough'</p> <p>out of box, overlapping squares</p> <p>sides, sides', picked up quarter but put on lines</p> <p>studies problem, -- drew rectangle, must 'contain' pigs</p> <p>really spread out, 'impossible'</p> <p>nothing to bite into', balanced metal on screw above it close to wood, can't see any other way!'</p> <p>not enough pieces', had it and then lost it</p> <p>4 diff sticks...only 3 can move</p> <p>filled in right angle, saw this space as 'crux'</p> <p>diag, almost, '3 more cause problems, incompatible with the math'</p> |
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| <p>tried squishing, saw holes, then sideways screw, had it but lost it</p> <p>2 circles joined, abandoned it</p> <p>forgot that a screw can screw after figuring out everything else</p> <p>diag, spread out, cannot see it</p> <p>kept quarters off paper, stacked but on the line</p> <p>spaces there, wouldn't try much, held cards</p> <p>had circular piece but abandoned, made larger circular arrangement, had one complete circle, abandoned</p> <p>laid them out on top of one another, got spaces but couldn't make it work and didn't 'understand' what she was doing</p> <p>2 then 4 on corners, coins in middle, 4 a side, 'touching line?' 3 in corner, 2 on inside...</p> <p>tried to square off</p> | <p>grabbed metal piece instinctively and pulled on it</p> <p>explored screw, saw holes, wanted to cinch, then got it</p> <p>saw that length of screw could change</p> <p>corners, 2 a side for a while</p> <p>drew the cross on paper</p> <p>pulled?</p> <p>circle right away, two together, then saw other pieces</p> <p>so each one isolated', first puzzle helped me</p> | <p>prompt, sides don't have to line up</p> <p>this won't work' tried other things</p> | <p>what am I looking for?'</p> <p>some way to tighten'</p> <p>seems simple, tried screw sideways, won't be tight enough', very fast</p> <p>diag, no prompt</p> <p>stacked, counted</p> <p>like sudoku, saw need for gaps right away because you can't make a 4x4</p> <p>no hose, tried to tighten by hand, studied screw, sudden!</p> <p>focused on edges, saw same lengths, matched these and 2 circles emerged</p> <p>saw impasse, then went outside box (sticks)</p> <p>got diag, then inside box (pigs)</p> <p>sideways screw, cinching, screw head, then saw 'stopper'</p> <p>oh right, there's 4, can there be holes?'</p> <p>cinched, saw holes cinched using screw, 'ah an unforeseen problem!' (too big), 'oh, I get it!'</p> <p>I'm using half the amt of quarters...</p> | <p>not enough pieces, needs to be smaller' (cross)</p> <p>how does this guy (big piece) work?</p> <p>this darn thing (big piece)', on an angle but didn't see it</p> <p>tried tightening two ends together, then checked, had to 'try it' then said 'won't get tight enough'</p> <p>share? Uh, no.' kept sharing on inside of hex</p> <p>did not look at screw, used it in various ways...</p> <p>saw the holed, tried hooking, 'too loose', still focused on bringing ends together, 'too loose'</p> <p>shared, then stopped</p> <p>all pink, all white, spread out, can't see how it will work, too many cards, not enough space...</p> <p>not enough quarters, too many sides</p> <p>4x4? spread it right out, never</p> |
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| <p>ends, did get impasse but did not see it, looking for something else perhaps?</p> <p>went within frame, drew diag box around middle pig</p> <p>4x4? spread it right out, never considered that separate cards are part of same row</p> <p>had it but couldn't see it, despite all prompts</p> <p>quarter ended up on top of another, couldn't see possibilities,</p> <p>had open spaces, then box</p> <p>plus sign, the angles are a problem, had it, lost it...</p> |  | <p>diag, out of box, spaces</p> <p>started with big pieces, long edges</p> <p>like sudoku, must have spaces</p> <p>shared, got principle of sharing, shared 3 on corner then shared 2</p> <p>hooked, explored screw, very tangible, I want to push that away', kept pulling hooks through loop, then got it</p> <p>flower, no border, focused on edges, too small, abandoned, then saw the possibility of it being separate pieces</p> <p>the problem is how to keep force against the screw with the screw driver</p> <p>curves make it too small of a circle, then got it!</p> <p>wouldn't use light fixture to hold screw, used pencil, then saw the light fixture possibility, 'I need to keep it tight against as I screw it in'</p> <p>each square has to be isolated, had trouble keeping track of square, kept leaving dots outside of it when didn't mean to, drawing was off</p> <p>these pieces don't fit, split it</p> | <p>considered that separate cards are part of same row</p> |
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| <b>Strategies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                         |  |
| <b>Trying harder, barrier focused</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Open, loose, willing to take risks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Assumptions leading to constraints</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Reluctance to take risks</b>                                                                                                                                                                                                                                                                                                                                                         |  |
| <p>drew again below, tried turning paper</p> <p>filled right angle</p> <p>checked tightness, saw holes, couldn't stop cinching</p> <p>sideways jammed in</p> <p>willing to make random shapes, had right pieces together but then abandoned, kept filling in right angle</p> <p>counted them, stacked them in middle in order to 'make them fit' into the side</p> <p>no gaps, couldn't see possibility</p> <p>abandoned circles repeatedly</p> <p>doesn't really look, just goes for it, had big piece on angle but didn't see</p> | <p>screwed with driver, then explored</p> <p>fiddled</p> <p>this square doesn't have to be this square'</p> <p>overlapped squares, then saw it</p> <p>flower, stood up, initially a big circle, aware that they may not be' could be multiple things, want to make tool, fast, missed connections, imposed own ideas but then saw it...</p> <p>willing to try things, sudoku? 1 on top? But they don't have to touch do they?</p> <p>by accident, then saw diag lines</p> <p>willing to do diamond and then figure it out</p> <p>spread it out sideways, used screw sideways, then saw real</p> | <p>ah! I didn't realize you could go out of the box!</p> <p>took apart, had screw head in loop, had backwards,</p> <p>saw holes, but kept hooking hooks, gave up, the real problem is I need a bigger screw</p> <p>I just can't envision what it might be</p> <p>the boxes have to criss cross, the dots have to be isolated from one another</p> <p>stayed inside, 2 per corner, 'I thought the word contain meant I had to stay inside' 'the problem is how to share 4 per side'</p> <p>I have to open this one up', stuck in box, 'maybe one of these DO have to move'</p> <p>have to keep middle sticks,</p> | <p>spaces there, wouldn't try much, held cards</p> <p>a separate enclosure...' no attempts to draw</p> <p>gave up, frustrated, angry</p> <p>Sudoku, NO! can't do it, left 3 cards in hands, left cards in piles.</p> <p>sudoku, stood up, what being bound by? Kept 3 cards in pile</p> <p>doesn't always 'follow through' with impulses, harder pencil strokes as confidence grows</p> |  |

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| <p>I notice the box comes down even harder when you can't get it, the boundaries scream even louder at you'</p>                                                        | <p>challenge, used screw lengthwise on an angle, didn't see but then did(pigs)</p>                                                      | <p>had trouble making two boxes intersect...</p>                                                                                                                                 |  |
| <p>upright, threw out, focused on 'fit'</p>                                                                                                                            | <p>willing to try even when can see it won't work, corners are key, questions helped, thought of looping rather than as a corner...</p> | <p>can't work!' put two circles together and the extra pieces into one.</p>                                                                                                      |  |
| <p>can't think of other options'</p>                                                                                                                                   | <p>turned on angle, drew it separate, got a bit stuck, then saw it</p>                                                                  | <p>fast, assuming all kinds of symmetries</p>                                                                                                                                    |  |
| <p>shared, counted to 6, stuck on sharing one on corners</p>                                                                                                           | <p>put 2 of some, then removed, removed a row, diag, 'maybe space between...' then did it all at once</p>                               | <p>didn't listen to instructions</p>                                                                                                                                             |  |
| <p>right away focused on clamp, jammed screw between clamp and cylinder, used strength to make it work, washer on other side, but worked</p>                           | <p>quick to jump in, on angle but didn't see</p>                                                                                        | <p>stuck in box, only thing in common are centre sticks, impossible</p>                                                                                                          |  |
| <p>stuck in box, redrew on separate page</p>                                                                                                                           | <p>tried 3 anyway</p>                                                                                                                   | <p>like sudoku, 3 extras, held them in his hand, 'rows and columns', moved some 'out' of box, I know I'm assuming it has to be a square....</p>                                  |  |
| <p>turned upside down, jam screwdriver?'</p>                                                                                                                           | <p>seems solvable', counted lines, took notes</p>                                                                                       | <p>focused on fitting the pieces together, I assumed they all had to fit</p>                                                                                                     |  |
| <p>tried squeezing, looked at screw and holes, wrong direction, washer other side, screw wouldn't turn, almost had it but hooks were twisted, didn't see/use holes</p> | <p>redrew 'what is different' (middle 4 sticks), 'that's impossible', well I'll have to share...</p>                                    | <p>hooked it, checked tightness, had hooks inside loop, willing to force it, wanted to tighten two ends together, tried opposite way around cylinder (vert), used screw head</p> |  |
| <p>scientifically impossible, can't add what I need?</p>                                                                                                               | <p>joined dots then saw it</p>                                                                                                          | <p>checked underneath, I assume I have to find something that fits in there (right angle), can't have a</p>                                                                      |  |
| <p>filled right angle, no matter how clear it was that nothing</p>                                                                                                     | <p>diag, tried things even when knew they were wrong, asks questions</p>                                                                | <p>organized into categories, stood up</p>                                                                                                                                       |  |

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| <p>would fit in space still tried to fill it</p> | <p>lots of trial and error, checked tightness, narrative</p> <p>shared 2 a corner, sideways, shared 1 6 in middle, 3 a side, 4 a side, picked up quarter, stacked 4</p> <p>just gonna go for it, obviously this doesn't work, asked questions</p> <p>focused on same, focused on similar, covered one, kept track</p> <p>one circle immed, 'well, this looked like it had to be a circle, it is the nature of my job to remain open to emergent patterns'</p> <p>4 a side, 3 a side, 1 shared on corners, counted coins in middle, 'she never said they had to be on the line'</p> <p>inside/outside, max 2 lines at once, explored impossibles</p> | <p>diag on end!</p> <p>made a long piece, 'I have to find my center' 'it has to be symmetrical'</p> <p>wanted to use clip, screw into back, 'wrench'</p> <p>kept centre 4, assuming centre sticks had to all stay</p> <p>tolerance for lack of fit seems to get in the way (plates)</p> <p>turned it but didn't see it, assuming that the orientation of cross rather than the shape was off, put right pieces together at end but didn't see it</p> <p>diag, off table, took cards away that didn't work, decided to scrap it</p> <p>tried to take out and move to another hole (screw)</p> <p>assumed top corner (sticks)</p> <p>sideways screw</p> <p>hooked right away, put screw down, didn't look at it, used screw sideways, gives up easily</p> |  |
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|  |  | <p>sideways, used screw head to push, 'why did I do that?'<br/>filled right angle (cross)</p> <p>usually a nut is involved, is hook involved?</p> <p>kept making complete shapes</p> <p>kept horiz/vert</p> <p>sideways, tested tightness with hands, used screw head, then went back to joining...</p> <p>diag, then messed up the cards</p> <p>laughed at circle as it emerged, then stuck two together, it won't all fit together though, 'maybe not all together, that will make it more complicated though'...</p> <p>filled angle, 'tried that already' don't know if it's because I can't picture what I am trying to make</p> <p>the middle 4 have to remain...'</p> <p>linked pigs, could not reverse her strategy to create isolated pens, diag, outside box...</p> <p>wanted to use another item to wedge, 'I don't do this kind of thing at home' started pulling, 'didn't trust myself'</p> |  |
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## Individual Styles Experiment 1

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| <b>INSIGHTFUL: SEES IMPASSE AND THEN SEES ROOT OF PROBLEM</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| obviously I'll have to leave blank spaces, always comes down to this one card,<br>cbc emblem, I'll just start, (part circle) wait that's too small, could it be 2?<br>what's the same, obviously want to move 4, that's the barrier, why can't I make it down here? Why not here?<br>saw it immediately<br>trial and error, this wouldn't work, that wouldn't work, the barrier is this space here (right angle), had it and didn't see, used grain of wood but didn't like the angles, why don't I stop thinking about the right angle and start focusing on the real problem which is how to make square ends...<br>$4 \times 6 = 24$ , that is convenient, obviously need to share, 3 a side, why can't I stack?<br>I want to go inside and grab that nut, maybe I'm not meant to use the screwdriver at all?<br>I need to hold the nut inside so that the screw/nut system works, I guess I could pull on it to create friction, is that working? Yes, but how will I completely tighten? This piece is in the way, I guess I could hold this and use the screwdriver<br>cinched 1st, saw failure, not tight enough, has to go between, just put these bad boys in the holes like it was designed, hope I'm on the right track! |
| <b>Barrier Focused: just tries harder</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| doesn't really look, just goes for it, had big piece on angle but didn't see<br>no gaps, couldn't see possibility<br>abandoned circles repeatedly<br>doesn't really look, just goes for it, had big piece on angle but didn't see<br>fold paper?' shared one but no more<br>counted them, stacked them in middle in order to 'make them fit' into the side<br>looked carefully at screw<br>how do I check my assumptions?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Constrained by assumptions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ah! I didn't realize you could go out of the box!<br>stuck in box<br>all in one?<br>stuck in same position/plane<br>joining the squares diagonally<br>kept big piece in perp position<br>shared once<br>I'm not very 'hands on'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

used the screw but actually needed to tighten clamp

**Humbly confident: vs hubris, lets go, explorative, tolerant of failure**

took notes, repeated how 'it's okay if I don't get them'

I've seen it before, can I remember?' 'this is where I wasn't sure' (second corner outside of box)

wrote it out, used goal language herself looked at it different ways, upside down etc.

put 2 of some, then removed, removed a row, diag, 'maybe space between...' then did it all at once

right away got two middle pieces, circle, then '2 shapes' redrew 'what is different' (middle 4 sticks), 'that's impossible', well I'll have to share...

seems solvable', counted lines, took notes

plays, seems happy, filled corner

2 per side, then 4 per corner

need a washer' used paper folded up, 'in real life...duct tape'

focused on hose, had screw in position but did not see solution,

**Instinctive: intuitively approaches problem**

remembered, out of the box

moved one row over

I'll go with this

I want to do this, but this is what I'll do

2 squares, diamond in the middle, lines on the right

filled right angle, used negative space to create cross

folded, left 6 in middle,

gravity to put pressure on toggle nut

hooked, checked tightness, explored screw, backwards, then cinching, saw that the screw was operable as tightener

visual, can erase it

my favourite ones, using hands, relevance to life, more sense of accomplishment

challenge, possibilities, no real use but I like problem solving in general

## Helpfulness of Intervention Experiment 1

| INTEGRATED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | GOAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ASSUMPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CONTROL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <p>try things but then ask why is this a problem? 'use block to move to a new way of thinking instead of just throwing away the blocked attempt'</p> <p>helped me think outside the box and in more abstract ways</p> <p>used to these, use diff persp's, made me more conscious of doing so</p> <p>In making me more aware of my own outlooks on problem solving, the experiment reminded me to choose more positive and productive outlooks, mainly focusing on the solution instead of the problem.</p> <p>practice helps, talking it out, turning it around, letting go of what doesn't work, trying something else, now I can ask the question: 'what is the real challenge here?'</p> <p>no patience for thinking about these kinds of things</p> | <p>outside convention, not stuck, look for loopholes</p> <p>this moves beyond these examples, can translate it into the real world, makes you see things differently, exp condition influences but it teaches too!</p> <p>solutions would help, generally felt pressured by time</p> <p>I'll make the same mistakes, it would be nice if it helped but realistically...</p> <p>practice helps</p> <p>I have to know the parameters/limits, it's only a few problems, practicing helps, it helps me have a broader scope for these problems and ways to approach them</p> <p>makes me think outside box</p> <p>a little bit larger scale, looking for obvious</p> <p>reminds of goal, otherwise spend useless time, impt in science</p> | <p>outside box, brain function, focus</p> <p>Questioning underlying assumptions has helped my problem solving skills. By encouraging people to think outside the ways we typically solve problems in our society, different solutions can be found. In increasing the range of solutions possible, there's a greater chance of solving the problem.</p> <p>quizzes are about rules so this helped to explore 'rules' patterns</p> <p>thinking outside of box, look at atypical meanings, take out of social context</p> <p>practice</p> <p>how do I check my assumptions?</p> <p>I am reminded not to limit my thinking</p> <p>no difference</p> | <p>yes, but the questions frustrated me, made me go where I didn't want to go...</p> <p>reminded of assumptions, think of diff alternatives, shown answer and see new possibilities</p> <p>no hints, no solutions of how to get out of box</p> <p>in some I got too repetitive, in some I thought too abstractedly and they were actually easier</p> <p>practice helps, reminded to think and chck assumptions</p> <p>type of strategies would help, like a math course</p> <p>I have not, in general, had difficulties 'thinking outside the box' in my life, however the ex quite graphically drew my attention to the fact that so often, the assumptions we bring to prob solving tasks are so basic that we can't see them</p> |

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| <p>a little bit, I think you have to get to it yourself, but the questions guide you, force you to think in a different way, I had to see it to understand it</p> <p>good practice, when you get stuck use other aspects/perspectives</p> <p>naturally puzzling it around, looking beyond problem</p> <p>unique experience, I won't forget it, I'll remember you asking me to see past the 'barrier'</p> <p>makes me think outside the box</p> <p>liked the question 'what is getting in the way' didn't know how to answer the other one</p> <p>it helped by asking me what is stopping me, I can see where I went wrong</p> <p>not very good at looking at the problem within the problem</p> <p>practical preparation,</p> | <p>shows us to think outside box, step back, think for a while</p> <p>forced to think in a way not normal to problem solving</p> <p>exercising brain, flexibility, longer you look helps you to think outside of the box</p> <p>repeated question, recognized first instinct wrong</p> <p>think outside box</p> <p>practice always helps</p> <p>It helped me realize that I often try to find innovative ways of solving a problem rather than simply just solving it.</p> <p>It hasn't on a noticeable level affected my problem solving ability, it did hinder my method of conversing however. I started mixing up my words in explanitive sentences - though this could be due to tiredness as much as this exercise</p> <p>for these kinds of problems maybe, with answers for sure</p> <p>you can use skills/ideas from previous puzzles</p> | <p>limited to these problems, might have practical relevance, primer helps</p> <p>interesting but not helpful</p> <p>yes, but the questions frustrated me, made me go where I didn't want to go...</p> <p>reminded of assumptions, think of diff alternatives, shown answer and see new possibilities</p> <p>no hints, no solutions of how to get out of box</p> <p>in some I got too repetitive, in some I thought too abstractedly and they were actually easier</p> <p>practice helps, reminded to think and chck assumptions</p> <p>type of strategies would help, like a math course</p> <p>I have not, in general, had difficulties 'thinking outside the box' in my life, however the ex quite graphically drew my attention to the fact that so often, the assumptions we bring to prob solving tasks are so basic that we can't see</p> | <p>looking at alternatives things, recognizing assumptions</p> <p>different way of thinking, we learn from books usually, too logical/analytical</p> <p>can look at things differently now, use previous problems and think along those lines, try to use the same reasoning</p> <p>outside box, reminder awakens skills, gets muscle moving</p> <p>stuck, bad, do it a certain way, know what to look for now</p> <p>helped more if I had solved them, if more experience, working on these</p> <p>long term no, we fool ourselves into thinking this will help us but we get caught up in our routines pretty quickly, the tough part is asking the questions</p> <p>I feel that I am a fairly systematic problem solver naturally, however, some of the exercises emphasized the need to draw out and keep track of possibilities, which sometimes I forego because of</p> |
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| <p>thinking outside of the box validated in other areas</p> <p>gets me to try to think differently, think of the real problem</p> <p>pointed out to look outside paradigms</p> <p>good reminders</p> <p>outside box</p> | <p>it made me think of other things, other ways, I really had to think about what you said, what you asked about what is the actual goal.</p> | <p>them</p> <p>looking at alternatives things, recognizing assumptions</p> <p>different way of thinking, we learn from books usually, too logical/analytical</p> <p>can look at things differently now, use previous problems and think along those lines, try to use the same reasoning</p> | <p>laziness or because I feel a sense of urgency.</p> <p>reminds you to think outside the box</p> <p>teaches you to 'go back to the principles', stay open, look at it a different way</p> <p>don't think of it at first, then 'of course!' trial and error really</p> <p>reminder, instead of banging head against wall, look at it a different way, reminder is good</p> |
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Solution Readiness and Problem Strategies Experiment 2

| <b>GETS SOLUTION/IMPASSE BUT NOT PROBLEM</b>                                                               | <b>INTUITIVE</b>                                                    | <b>SEES FAILURE AND SOLUTION</b>                                                | <b>SEES PROBLEM AND SOLUTION</b>                                                                                                                               | <b>SEES PROBLEM BUT CANNOT GET SOLUTION</b>                                                                                  |
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| <p>filling ends, sliding pieces, need to square it off, had it but didn't see it</p> <p>had 2 circles,</p> | <p>3 lines, out of box?</p> <p>instinctively pulled, abandoned,</p> | <p>can't spin it? 4 moves, move down...</p> <p>nothing really fits, had one</p> | <p>corners, stacked when considering other approaches</p> <p>arrow, needs to be bigger (9 dot)</p> <p>need to get rid of one stick, I could lay it on top,</p> | <p>the problem is where to start? (9 dot)</p> <p>sees it but doubts her ideas</p> <p>need more line, need to go out, can</p> |

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| <p>abandoned, attended to pencil markings, inside edges and then got it</p> <p>I suck at this, had it, didn't see it, middle piece?</p> <p>on angle but didn't see it several times, wanted to make square ends on the ends of big piece...</p> <p>4 a side, 2 a corner, 3 a side, cleared it, defies math, ended up stacked once but did not see it</p> <p>stacked them but didn't see, the sides are crooked, too many sides, I'm missing something</p> <p>confident, extended line, then brought it in, twice.</p> <p>changed minus to equals but wouldn't consider keeping 2 equals</p> <p>very close, diag, then</p> | <p>bottle opener?</p> <p>want to go outside...(9 dot)</p> <p>how they fit</p> <p>inuitive, visualized it</p> <p>want to flip it, want to make this box, have to make it somewhere else</p> <p>I see a fish, I can see it differently, it needs to swim this way</p> <p>saw circle and how pieces fit</p> <p>saw new shape saw right angle</p> <p>pulled right</p> | <p>circle, then another, put together, then added centres...are there two circles??</p> <p>keep middle sticks, saw opp to build outside frame elsewhere</p> <p>overlapped squares then saw 'need to make many lines'</p> <p>3x4, impossible! Matrices, 3D, okay, what I need is a 4x4 with spaces</p> <p>alternative coins, can't be done, not enough coins,</p> <p>vertical, filled angle, spin big piece</p> <p>vertical but</p> | <p>equals?</p> <p>spaces, extend box...</p> <p>must use outside box, lots of boxes...</p> <p>have to move this one square</p> <p>have to make enclosures, overlapping each piggy needs own square</p> <p>on angle, erased, then realized must make many compartments'</p> <p>make it look the same somewhere else</p> <p>create more boxes</p> <p>create square edges</p> <p>share more coins</p> <p>want to flip it, want to make this box, have to make it somewhere else</p> <p>shared, need to make them count for more to get four a side (reminder = goal)</p> <p>the goal: make it look the same, somewhere else?</p> <p>overlap, goal = make enclosures</p> <p>diag, built rows, saw that spaces were needed right away, any number of rows/columns?</p> <p>2 circles? Attending to outer edges and how</p> | <p>get 2 dots per line, 3 lines can do 2, and 1 line 3...</p> <p>too much wire in clamp, I want to cut some out, bend it...</p> <p>need to screw into something, make hole smaller, thread it into something</p> <p>one dot left over, don't want to go through middle, want to start somewhere else maybe.</p> <p>too many dots</p> <p>one too many sticks, trying plus, making another number</p> <p>filled angle, missing pieces, I'm focused on making the big piece the middle, need to build ends...</p> <p>too many sticks circles, a few? Circum too small for one</p> <p>extra column, too many cards, can't think of anything else, feels impossible, could use 9 dot strategies somehow, but don't know how...</p> <p>not locking in, hole too big, no idea! Tried turning screw again</p> <p>don't know where to put extra one</p> |
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| <p>missed it, questioned columns and rows, where to put the cards</p> <p>diagonal really impt, can't be done, spaces, not two repeating, use colours?</p> <p>folded at 30, had it but didn't see, stacked, on corners...each one work as two</p> <p>diag, had it, lost it, too many, need 4 wide, need to incorporate...spaces?</p> <p>filled angle, squared off end, missed it several times, then saw it when trying to build square end</p> | <p>away, instinct</p> <p>sideways, cinching, screw head in loop, stared, instinctive</p> <p>saw right away</p> | <p>saw it wouldn't work, let go and made the cross</p> <p>hooked sideways screw, forcing, saw overlap</p> <p>can't move 4 sticks, need to focus on another shape as base</p> <p>CBC logo, matching lines, 'it's not a circle', 1/2 circle</p> | <p>they fit and what they made</p> <p>not enough, need to make each share, count for 2 another way,</p> <p>need to square off end, can't find anything to fit, why?, not enough pieces</p> <p>not enough, shared, math...</p> <p>focused on box (8 sticks)</p> <p>round edges on outside, not enough pieces, too small of frame, 1 shape?</p> <p>studied clamp carefully, sideways, nodded</p> <p>instinct, 'pressure on nut'</p> <p>went right, not left, then saw it after questions about new principles 'it doesn't need to move', then saw diff angle</p> <p>kept repeating goal 'separate enclosures', diff angle?</p> <p>I want to go out of box, a bigger shape, connect that extra dot, paused on 2nd corner of arrow</p> <p>stacked 4 coins, grouped them, wanted to fold page, then thought of stacks on shared corner</p> <p>want to hold what's inside, aggressive and confident with hands</p> <p>the ends (of clamp) need to go beyond</p> | <p>(match)</p> <p>turned box upside down, couldn't feel a grip</p> <p>6 into centre, what do I do with these?</p> <p>overlap needed, considered screw, roles of each part?</p> <p>extended beyond box, each one in own, use outside box? Diag, exclude more of the pigs? Outer box...</p> <p>sideways screw, clamp is too big, I don't see what the screw is for</p> <p>separated corner pig, overlapping, rectangles, 9 dot, attach squares somehow, use outer square?</p> <p>overlapping, #'s of lines, math with lines, outside of box, angles when I went to pull it away, needed a new view</p> <p>building long piece, filling angle, not linear, must be strange, angle? Hard to be systematic, somehow the big piece needs to be in middle, losing track</p> <p>outside box? Different shape?</p> <p>I need to fill the gap in the hole, I</p> |
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|  |  | <p>can't hold the nut with my hand, if I pull, it will hold it still</p> <p>drew dots, own square, overlap, make more squares, more enclosures</p> <p>open spaces need to be recreated</p> <p>overlapping, then used outside, focused on creating enclosures</p> <p>shared, spread out, 2 per corner</p> <p>stops and thinks, put box on side, started to pull, then felt catch</p> <p>cinched, took time, tested size, stared and studied</p> <p>spread it out, where 4th row fit in?</p> <p>utilize 4 lines better</p> <p>not enough quarters, need to double up</p> <p>need to hold nut somehow</p> <p>diag, 60 seconds had it but messed it up, all but one card, then ready for spaces</p> <p>built below, right, then left, had to build this structure somewhere else</p> <p>enclosures, isolate</p> <p>filled angle, find the middle?</p> | <p>need inside</p> <p>extra stick, trying IV</p> <p>3 a side, count for 2, 2 a side...</p> <p>diag, all cards?</p> <p>redrew, need to include as many as I can, began to consider line on angle and only 2 dots...</p> <p>3 groups of 4, diagonal, I want ti to be 3x3, 4x3 and got stuck</p> <p>how can I use the extra stick so it doesn't mean anything...</p> <p>patterns, I want to get that dot, shape needs to be bigger</p> <p>overlapped cards, 3 in every row, repeated goal</p> <p>4 a side, 3 a side, 2 a side, 2 a corner, something has to happen to the quarters, outside hex?</p> <p>folded at 180, stacked in middle, need to get 6 left over to touch more than one line...</p> <p>sideways, cinching, screw head in loop, clamp is too big...somehow hook this onto screw...</p> |
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|  |  |  | not enough quarters, need to double them<br><br>won't turn, how to make this smaller... |  |
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| <b>STRATEGIES</b>                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <b>Try harder, barrier focused</b>                                                                                                                                                                                                                                                                                                        | <b>Trial and error, random explore, openness, 'out of box'</b>                                                                                                                                                                      | <b>Prior knowledge</b>                                                                                                                                                                                                                                       | <b>Methodical problem finding</b>                                                                                                                                                                                                                                                                | <b>Hits wall and gives up</b>                                                                                                                                                                                                                       | <b>Assumptions leading to constraints</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p>want to get all the dots in one row, want to catch the dots</p> <p>sideways screw, then length, kept putting screw too far into hoop</p> <p>cinching, focus on screw, not tight enough, kept trying one approach,</p> <p>in box, need to keep trying poss's not exhausted all alternatives yet, I need a change of pattern somehow</p> | <p>moved tirangle away, used as crosspiece,</p> <p>intuitive, can't make a circle, too many round edges, too small, I don't like things to not fit exactly, round edges need to be on outside,</p> <p>out of box, take pig out,</p> | <p>overlap, diag, outside, used 9 dots as guide</p> <p>grabbed it, intuitive, didn't hold at first but was certain, 'need to create resistance on washer'</p> <p>seen before, filled angle, then started to remember that the middle piece was in a diff</p> | <p>12, 6, 4 a side, need to make quarter go for 2 sides.</p> <p>want to wedge the screw, need to use these holes, not tight enough, aha!</p> <p>had it right away, didn't see, want to get rid of this angle, want big piece in middle, want to cut off this end, aha!</p> <p>diag, too many</p> | <p>defies math! (hex)</p> <p>this screw doesn't fit anything</p> <p>barrier is that it doesn't add up!</p> <p>need to create a space where there is no space, 3x3 stuck</p> <p>sideways screw, make cylinder bigger? Jam screw in between, kept</p> | <p>dimensions? 6 sides, join dots</p> <p>another way to flip it? Another way to make these spaces? Stuck in box</p> <p>I can't do these kinds of things</p> <p>keep centre sticks, these can't change, kept focusing on barrier</p> <p>overlap, stuck on vert/horiz</p> <p>overlapping, more compartments, anything else wouldn't be a square</p> <p>kept right, not left, needs to equal and it doesn't work</p> <p>need to stretch the quarters along the line somehow,</p> |

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| <p>kept trying to make the one side equal 2, cinched repeatedly</p> <p>you can't keep track, persist, don't give up, usually works</p> <p>cinched for a long time, couldn't get washer on other side of hoop, then saw the real problem, 'I hate this.'</p> <p>keep doing same thing, can't seem to let go</p> <p>diag, missed it, messed it up again, 3x3,</p> <p>not enough, folded at 300, want to make a smaller hexagon, want to use 50cents to make a phone call,</p> <p>sideways, kept trying to make sideways work.</p> <p>long piece, cut off</p> | <p>angle, size of box</p> <p>intuitive, looked at how they fit, what they might make, used imagination..</p> <p>overlapping, need to use outer square too, let's just look, imagine...aha!! How do I use my second box? Aha!</p> <p>moved down, 'not what you think', white space seemed to beckon</p> <p>diagonal</p> <p>make one side smaller, keep going back to old strategies, need to think</p> | <p>position or there was something diff that needed to happen with it</p> <p>can't remember!</p> <p>had it, lost it, didn't see, has seen T before</p> <p>non listener, tried to recall old problem solving tools, examples...</p> <p>seen before, out of box, got stuck twice, then saw it</p> | <p>cards, need a 4x3, but that won't work, need a 4x4 but then there will be spaces</p> <p>re drew, top corner focus, drew box, saw that it could be flipped down as well, moved down</p> <p>'needed to make space, then needed to shift them slightly to make it work, couldn't see how my last card fit in...'</p> <p>12 quarters, 6 sides, put 2 a side to balance, folded, then saw 4 stacked flat</p> <p>circle right away, looking at 'cuts', binding, diff kinds of wood, lines, 1/2 circle then full</p> | <p>clamp around cylinder whole time, nothing fits!</p> <p>feels impossible, difficult to think beyond 2 pigs, 2 squares</p> <p>seems impossible</p> <p>along the line? Not possible, one in centre</p> <p>had it, lost it, messed it up, gives up easily, had it 2nd time, one card away, didn't tolerate spaces</p> <p>no way it can be done with all cards, extra cards</p> <p>no alternatives...</p> | <p>too many cards, need 4x3</p> <p>filled angle, can't make square ends anywhere else</p> <p>make every stroke count, don't want to leave any behind</p> <p>too many cards, need to be a grid? Free flow, close but didn't see, I need a 3x3</p> <p>the hole is too big, need to secure the screw somehow or make a new hole</p> <p>don't want to move the middle cross, holes to fill, need to keep it equalling II</p> <p>stuck wanting to make it in upper corner, want to make this box here</p> <p>filled angle, this space bugs me, it doesn't make what I envision, can I just leave it blank? Solutions are often 'forced'</p> <p>not a real problem, in reality would use an anchor, can I use the metal piece somehow to anchor the screw?</p> <p>need to fill space, no part of a plus has a right angle,</p> <p>need to cover extra dot</p> <p>complicated it</p> <p>built from one card up, diag, on outer corners, '3 extra cards, how do I fit them in'</p> |
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| <p>this angle, still filing ends, on right track, this end is giving me trouble, I need to get rid of it!</p> <p>stuck in box</p> <p>hole is too big</p> <p>hooked, looked, sideways, how it fits? Backwards?</p> <p>we always approach things one way, it is important to look for new approaches, consider that maybe another way is better, we usually don't think this is even possible until we see it in something like these problems, we just need to TRY</p> <p>everything but the answer, complicated it</p> <p>drew it, touching, filled up? (cards)</p> <p>filled angle,</p> | <p>outside...</p> <p>1/2 circle, saw it</p> <p>heart, matching lengths, one shape, separated</p> <p>stumbled upon it, kept moving the piece along edge, saw it, close to giving up</p> |  | <p>upper right, bottom left, bottom right</p> <p>circle, consistent radius', too much stuff', focusing on outside, shape, formed an 8 then separated</p> <p>heart, focused on circle and round edges, then paid attention to inner edges and 'fit'</p> <p>sideways, then saw screw char's, cinched it, correct but backwards...</p> <p>filling angle, hor/vert, fillin spaces, square ends, turned on angle...</p> <p>sideways screw, studied screw etc., hooked, cinched, have to go with design',</p> |  | <p>round edges, 2 shapes? How fit together?</p> <p>3/4 circle, wanted 1 shape,</p> <p>use screwdriver to wedge? Not catching, can I balance it?</p> <p>saw holes 1st, cinched, make smaller? Balanced it....</p> <p>what shape? Circle? What other shape could it be?</p> <p>how fill space at ends, leave big piece and focus on others, trick? It will be something strange...</p> <p>can I move sticks in both? 4 blanks, need to overcome that</p> <p>hole is too big, teeth aren't catching, I could tape it,</p> <p>hole too big, used screw driver to wedge</p> <p>looking for a pattern, connect the dots</p> <p>cinched, used screw head fixed, twisted clamp until tight....</p> <p>why not tightening? Hole too big, can't make it smaller, can't make screw bigger, jam something in there?</p> <p>must keep the middle cross the same, nudge it? Rotate?</p> <p>make vert lines the same, turned upside down, stuck on 4 sticks</p> |
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| <p>convinced something worked</p> <p>2 overlapping repeatedly,</p> <p>4 a side, 12 coins, 6 sides, what is a side? 3 a side</p> <p>hooked, jammed something, sideways screw tight</p> <p>cinched, hooked, sideways screws, seemed to have little knowledge or experience with tools.</p> <p>4x3, solid? Zig zag...</p> |  |  | <p>has to move beyond eachother' aha!</p> |  | <p>twisted, jammed something, a trick?</p> <p>circle, abandoned it, saw it again</p> <p>filled angle, pivotal piece, had it, filled it, moved it...</p> <p>complicated it, 'duh!'</p> <p>overlapping squares, box in middle..</p> <p>laid them out, trial and error, circle, left over pieces...</p> <p>filled end, flat end, oddball pieces', stacked them</p> <p>counted sticks, what sticks not move, 'constrained by that'</p> <p>filled angle, want to get rid of angle, crosspiece, which way?</p> <p>shook it, tried screw, layed down, position screw to cause grip, turned clip...</p> <p>sideways, move square piece to spread ends, not good with my hands, didn't use screw to do it</p> <p>pig separated, overlap, can't use onexone, not utilizing squares well...</p> |
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Individual Styles Experiment 2

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| <b>INDIVIDUAL STYLES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Barrier Focused</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p>dimensions? 6 sides, join dots</p> <p>'you can't keep track, persist, don't give up, usually works'</p> <p>drew it, touching, filled up?</p> <p>laid them out, trial and error, circle, left over pieces...</p> <p>counted sticks, what sticks not move, 'constrained by that'</p> <p>2 overlapping repeatedly, out of box, take pig out, angle, size of box</p> <p>filled angle, 'want to get rid of angle', crosspiece, which way?</p> <p>4 a side, 12 coins, 6 sides, what is a side? 3 a side</p> <p>shook it, tried screw, laid down, position screw to cause grip, turned clip...</p> <p>sideways, move square piece to spread ends, not good with my hands, didn't use screw to do it</p> <p>every problem you are tackling, there are different ways, shouldn't think linearly</p> |
| <b>Metacognitive Problem Finding</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>need to look at it in a new way, on angle, not in box...</p> <p>made one side smaller, keep going back to old strategies, need to think outside...</p> <p>got it, needed to make space, then needed to shift them slightly to make it work, couldn't see how my last card fit in...</p> <p>3/4 circle, wanted 1 shape, then saw wouldn't work</p> <p>keep middle sticks, saw opportunity to build outside frame elsewhere</p> <p>overlapped squares then saw need to make many lines,</p> <p>had it, lost it, didn't see, has seen T before</p> <p>shared, spread out, 2 per corner</p> <p>stops and thinks, put box on side, started to pull, then felt catch</p>                                                                                                                         |

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| cinched, took time, tested size, stared and studied<br>good feedback, can tell when something is working, feel when you are overcoming it                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Constrained</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| need to cover extra dot<br>complicated it<br>built from one card up, diag, on outer corners, '3 extra cards, how do I fit them in'<br>round edges, 2 shapes? How fit together?<br>empty spaces need to fill, flip it? rotate?<br>not enough lines, same solution over and over again, the goal: new way to use squares<br>need to fill space, no part of a plus has a right angle,<br>not enough, need to make each share, count for 2 another way,<br>not locking in, hole too big, 'no idea!' Tried turning screw again<br>sideways, then saw pushed beyond, saw role of screw, holes, washer<br>want to get everything right, frustrating<br>more used to this kind<br>liked when I got right, got stuck easily on these ones, perfectionist, don't like when I can't get them |
| <b>Lacking Confidence Despite Insight</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 5th line? More line? Assumed stay in box<br>complicated it<br>more creative ideas, but never adds up<br>very negative, too many cards, not enough rows, I can't do this, I suck<br>too many possibilities, can't reframe, "I hate you! :)"<br>need to make more lines but couldn't solve<br>need to utilize pieces more, build ends...couldn't solve                                                                                                                                                                                                                                                                                                                                                                                                                              |

folded at 180, stacked in middle, need to get 6 left over to touch more than one line...couldn't solve

need to hold nut somehow, couldn't solve

saw holes, careful, afraid to break it...unsure of self, couldn't solve

It has helped in terms of how I think of problems- I will (hopefully) be more critical (analytically speaking) of my own thought process as I go about a particular problem. This is because the exercises made me realize how quick I can be to impose unnecessary limitations. The quarter exercise emphasized this to me especially.

I liked the puzzles because they were engaging on a more holistic level than some of the other exercises...like the screw for instance...(!). I just felt helpless and stupid w. the screw and box problem...

Also they were simply more fun, less frustrating. Like word puzzles and things of that nature.

At first I picked "liked", but I think I'm more neutral as I felt more frustrated than anything else, especially during the screw exercise, and also the one in which I had to tighten the clamp like thing around the tube. The thing that made them mostly "unlikeable" was the fact that as I was doing them, I knew there was a way to do it, but was unable to accomplish it. Knowledge of one's 'inability' is generally an unpleasant experience- an annoyance. I don't think there is really any reason to totally dislike or even dislike the exercises though. Something that cause physical pain or real stress, fatigue etc. might rank a "dislike" or more.

### **Intuitive**

one dot left over, don't want to go through middle, want to start somewhere else maybe.

want to flip it, use =

extra stick, want to make - from +

diag, too many cards, need a 4x3, but that won't work, need a 4x4 but then there will be spaces

intuitive, can't make a circle, too many round edges, too small, I don't like things to not fit exactly, round edges need to be on outside,

want to flip it, want to make this box, have to make it somewhere else

inuitive, visualized it

had it right away, didn't see, want to get rid of this angle, want big piece in middle, want to cut off this end, aha!

not enough, 2 per side, share, shared flat

need a bigger screw, wedge something in, nothing to grasp on to, not much inclined toward using tools, want to wedge the screw, need to use these holes, not tight enough, aha!  
makes me see things in diff ways, I'll consider these in future  
I can lay things out, manipulate, I'm visual, it allows me to try diff things lets me move things around, see diff perspectives

### **Insightful**

extra stick, on top  
doesn't have to be square?  
Focusing on edges, want it to be a circle  
I see a fish, I can see it differently, it needs to swim this way  
each piggy needs own square  
square off, where else? Doesn't have to be hor/vert...  
how can I double the leftover coins?  
I want to get inside, hold the nut,  
needs to be smaller  
outside of box, moving, think out loud  
I can draw it to visualize can move them, can try things and quickly realize what doesn't work

## Helpfulness of Training Experiment 2

| <b>INTEGRATED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>CONTROL (GOAL/ASSUMPTION)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <p>repeated questions, good reminders, dug down to things I hadn't thought of</p> <p>outside of box, moving, think out loud</p> <p>It prompted me to consider a variety of different problem-solving avenues instead of my usual "I-can't-figure-it-out-right-away-so-I-give-up" response to such puzzles.</p> <p>conscious of out of the box, look for unobvious</p> <p>got stuck on , remind me not to assume, good rule</p> <p>parallels, uses diff parts of brain, short term, diff angles</p> <p>opens minds, I already think this way</p> <p>I think that it helped me look at problems (small or big) in a different way. I learned to try not to give up on myself when solving these problems.</p> <p>keeps us attuned to the way problems work</p> <p>helped, by getting me to focus in on exactly what the problem is</p> <p>really trying to use tools like looking at barriers, obstacles, what I am really trying to do</p> <p>but these problems are limited, not applicable to more wholistic problems</p> <p>The exercise helped me to mentally (and verbally) articulate which</p> | <p>every problem you are tackling, there are different ways, shouldn't think linearly</p> <p>later I'll forget, no connection to other problems,</p> <p>I fail to see link to other problems,</p> <p>haven't learned the answers</p> <p>let go, rehearse concepts, questions</p> <p>gave me an inventory of strategies and ways of approaching problems</p> <p>with repeated practice, I'll forget principles</p> <p>we always approach things one way, it is important to look for new approaches, consider that maybe another way is better, we usually don't think this is even possible until we see it in something like these problems, we just need to TRY</p> <p>talking about it helps, like computer programming, always an interface with which to 'dialogue', talking helps activate diff pathways cognitively, picked up clues, tried to pick up clues from you!</p> <p>did help me think in diff ways, in new dimensions, realize that problems are not always categorical</p> <p>It taught me me new ways in which to "think outside the box." It made me more mentally alert for the short term at least. I can't think of any way it may have hindered my problem solving ability</p> <p>in similar sit's reminders are helpful, applies to real problems too</p> |

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| <p>exact components of the task were preventing me from completing it. In other words, the exercise helped me to identify the limits I was facing in solving the problem, rather than feel "stuck" by the entire problem.</p> <p>It has helped in terms of how I think of problems- I will (hopefully) be more critical (analytically speaking) of my own thought process as I go about a particular problem. This is because the exercises made me realize how quick I can be to impose unnecessary limitations. The quarter exercise emphasized this to me especially.</p> <p>physically manipulate, talking it out</p> <p>not completely, not an extra person around asking me these questions</p> | <p>The interviewer and the exercises taught me to think outside the normal realm of possibilities, not to dismiss achieving a goal when it seems impossible, and to search for innovative solution</p> <p>repeated questions kept me focused on goal and checking assumptions</p> <p>maybe for one day, won't last</p> <p>After the exercise I decided that I would try to remember some of the solution, taking into consideration that one of the questions was if I could remember a similar problem whenever I was stuck in an exercise.</p> <p>yes, I can refer to these later to help me in other situations like I did during the experiment (used other problems from experience)</p> <p>makes me see things in diff ways, I'll consider these in future</p> |
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**Appendix G: Control Group Qualitative Data Experiment 3**

## UNRESOLVED CHALLENGES

| CHALLENGES PRE                                                                         | STRATEGIES PRE                                                   | THREATS                                                                                                          | CHALLENGES POST                                                                                       | THREATS                                                                                                                                                       | STRATEGIES POST                                                                                   |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| lifting weights, walking up stairs, vibration                                          | physio                                                           | long term effects that might happen if I don't solve it now                                                      | little pain left                                                                                      | no work                                                                                                                                                       | none                                                                                              |
| to sit for a long time                                                                 | physio                                                           | can't get out and enjoy being with my son, family, and friends, I worry this will not get much better            | to sit for a period of time without pain                                                              | long term effects? will I ever recover and be able to do all the things I could before I injured myself?                                                      | stand or walk for a few mins or lay down                                                          |
| walking any distance, getting back to normal                                           | rest, ice, when injury is aggravated started light exercise      | not able to do the things I once did                                                                             | find out why it is not getting better as fast as it should and what exactly is wrong with it          | not able to do the things I once did                                                                                                                          | resting my knee, exercise stretch strengthen, try and work through the pain                       |
| sitting, sleeping, driving, bending                                                    | stretching, strengthening, with little weights                   | emotional and financial unable to work, unable to study properly, unable to visit friends and places of interest | coping with the pain to be able to do everything back to normal in all my work, activities and sports | my sport activities and reflexes I have not been able to earn my full wages, furthermore I am finding it somewhat difficult to concentrate in my studies as I | strengthening my legs and muscles                                                                 |
| walking, stiffness                                                                     | physiotherapy                                                    |                                                                                                                  |                                                                                                       |                                                                                                                                                               |                                                                                                   |
| undergoing the recovery phase and rehabilitation after second surgery on my left tibia | undergone second surgery for removal of plates and screws, rehab | due to immobility, I have gained weight and been unable to train for triathlon/bike cross country.               | having my left ankle sore when I try to put full weight on the leg                                    |                                                                                                                                                               | slowly, slowly increasing putting weight on left leg, in addition I am doing exercises and physio |

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| pain, will not go away, gnawing at my knee, walking long distances a challenge, stairs are a big concern                                                                       | physio and kinesiology/surgery                                                            | it causes inconvenience and difficulty in functioning                                                                                         | mentality, having a knee surgery is said to take years but psychologically the pain is gone, stairs are still a challenge | have to take some examinations soon training for my x country bike trek has been delayed, and I will not be competing in any triathlons any time soon whether I can find a job to make a living in the meanwhile. If not I don't know how to support myself and pay my bills. being sent to work too early and not being able to do my job properly | going to the gym, running, exercise                                                                      |
| I'm concerned if I can get back to normal strength                                                                                                                             | rehabilitation                                                                            | I worry somewhat about a full recovery I worry that this injury and pain will never completely go away and will bother me the rest of my life | difficulty to find a job using my hands                                                                                   |                                                                                                                                                                                                                                                                                                                                                     | continue to look for a job that won't hurt my injured hand                                               |
| limited mobility, pain pain, not being able to perform my regular ADL household chores, unable to socialize, not able to go to work, losing seniority, hours, pay, benefits... | physio, self pain management, (no drugs or alcohol) unless prescribed                     |                                                                                                                                               | strength and balance                                                                                                      | being sent to work too early and not being able to do my job properly                                                                                                                                                                                                                                                                               | balance beam, walking sideways, backwards, balance board                                                 |
|                                                                                                                                                                                | physio, OR program, exercising at home, pain killers, assistance from family and friends. | returning to work uncertainty about the future, physical limitations to do activities, both work and                                          | pain preventing me from returning to work and ADLS                                                                        | pain will still be there not completely gone.                                                                                                                                                                                                                                                                                                       | physio OR rest exercise, pain killers, stretches. have done a lot of walking, lifting of heavier weights |
| pain                                                                                                                                                                           | hot tub, rehab                                                                            |                                                                                                                                               | I have no problem returning to work                                                                                       | that I will reinjure                                                                                                                                                                                                                                                                                                                                |                                                                                                          |

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|                                                                                |                                                                                                                                                                         |  | pleasure, highest stress probably dealing with WCB and their antagonistic file adjusters who have no knowledge of me, my job, or of medicine!                                                               |                                                                                                                                       |                                                                                                                                                                                                      |                                              |
| uncertainty about future, work, income, pain, limitations, ability to function | inner dialogue, acknowledging the above uncertainties and getting on as best I can. Studying areas of interest, stopping when pain is too much rather than ignoring it. |  | it has lasted too long, I worry if I will ever be the same physically as before the injury                                                                                                                  | uncertainty about pain and future ability to work, about restrictions on activities, about pain level increasing, possible litigation | loss of freedom of choice re activities and future plans, concern about financial security, altering of cognitive function that my back will never be normal and that it may continue to deteriorate | council with friends and family              |
| back spasm, lower back pain, can't stand, sit or walk for extended periods     | physio, exercise, medication, rest                                                                                                                                      |  | my inability to work fully, possible long term effects physically as I am 55 yrs old, I have some concern that I will have residual pain and reduced range of motion into my retirement in 2 years          | sitting longer than 5 mins, standing still and bending at the waist (doing dishes etc)                                                |                                                                                                                                                                                                      | back strengthening exercises, keeping mobile |
| uncertainty about whether the pain will go away and stay away                  | focusing on core strength                                                                                                                                               |  | time and I hope this will not affect what I hope to be an active retirement lots of work, stress, lost school degree, couldn't attend school, loss of activities, can't care for my niece, feel like I have | keeping up my core strength                                                                                                           | maybe one day I would have to have surgery                                                                                                                                                           | don't slack off at home, or get sore         |
| range of motion and functional ability                                         | analgesia and physio                                                                                                                                                    |  |                                                                                                                                                                                                             | being able to do my job at full capacity without too much pain or difficulty                                                          | will the recurrent pain continue?                                                                                                                                                                    | physio, meds, ORI program                    |

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|                                                                                                 |                                                   | to depend on others,<br>loss of freedom                                                                                                                                 |                                                                                                                                                                        |                                                                                              |                                              |
| stress, driving, unable to perform normal activities, not able to care for my 8 month old niece | specialists, doctors, physio, stretches           | to get healthy caused me to become less active as a result of pain                                                                                                      | finding compatible work, and the pain                                                                                                                                  | loss of school, work, and many personal activities                                           | stretching, alternative job search           |
| money concerns                                                                                  | this program, weights, stretching, physio, doctor |                                                                                                                                                                         | money issues, new job                                                                                                                                                  | uncertainty financially if I can't work, I'm in trouble financially, my family depends on me | this program                                 |
| having to work, everyday basic duties, length of time, reinjury                                 | physio, exercises                                 | social, daily, normal activities and mobility is compromised                                                                                                            | concerned if I will ever be able to get back to work or to the things I used to be able to do                                                                          | not being able to return to work                                                             | the pain and lack of progress is frustrating |
| get back to work                                                                                | physio, program                                   | not being able to sail                                                                                                                                                  | not being able to return to work<br>ability to continue fully as a production line worker, the cause of my continued arm pain, financial status could be up in the air |                                                                                              | keep trying                                  |
| to be able to get 100% use out of my arm again and return to work                               | physio                                            | financial and health problems such as weight gain, and headaches and lack of sleep and mobility<br>just being able to return to work and keep going without this injury |                                                                                                                                                                        | financial, it has delayed my life how do I change my career with this injury and at my age?  | just cope with pain                          |
| returning to work, don't bounce back the way I did at 20                                        | getting back to working condition and strength    | starting up again or coming back worse                                                                                                                                  | trying to find a new job and retraining                                                                                                                                |                                                                                              | checking job sites on the internet           |

**RESOLVED CHALLENGES / SATISFACTORY STRATEGIES**

|                                                                                                                                                                     |                                                                                                                                |                                                                                                                                 |                                                                                                                                                                                              |                                                                                                                                                                                                                          |                                                                                                                                          |
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| the inability to do my job fully the biggest challenge is properly strengthening my back so I can return to work with little or no chance of reagravating my injury | chiro, OR1 program                                                                                                             | not being able to play sports or do what I used to do                                                                           | only the slight pain in my thumb                                                                                                                                                             | only the thought of re injury                                                                                                                                                                                            | exercising it, ultrasound being careful not to bang it                                                                                   |
| unable to perform manual, social, regular activities                                                                                                                | physio, daily stretching, light workouts                                                                                       | concerned about getting back to work, financial issues will I be able to do the job, if not, then what work can I do and where? | stiffness with prolonged work activities                                                                                                                                                     | lifetime back pain inability to do things I would have otherwise participated in to be able to go to work, to be able to do sports                                                                                       | stretching, light workouts at the gym not to overdo some of the things that would increase the pain to build strength back up in my knee |
| will the knee hold up doing my job?                                                                                                                                 | treatment, exercise, medication, rest                                                                                          | not being able to do the things I want to do                                                                                    | continuous pain in the knee, back and elbow                                                                                                                                                  | getting back to normal with no pain or numbness not being able to work, make money I have to return to work 100% and I have about 90% and other knee injury concerning me a little not being able to resume my work like | accupuncture, physio, massage the program at the clinic, exercises                                                                       |
| returning to work and having the same pain and numbness reoccur once again, or worse than before                                                                    | exercise                                                                                                                       | work, doing what I want to do                                                                                                   | being able to go back to work numbness in finger and thumb coming from shoulder very wary of lifting anything have become weak working is not possible, worried whether I will ever get back |                                                                                                                                                                                                                          |                                                                                                                                          |
| pain, movement, not being able to work                                                                                                                              | following through with the techniques I have learned here at the clinic                                                        | may not be able to return to work at 100%                                                                                       |                                                                                                                                                                                              |                                                                                                                                                                                                                          |                                                                                                                                          |
| getting better fast, but due to injury not possible                                                                                                                 | clinic program                                                                                                                 | the flare ups, no control, unpredictable financial burden, it messed up my plans for future schooling                           | a little pain but tolerable my biggest concern is to resume my work, and to get the strength of my                                                                                           |                                                                                                                                                                                                                          | keen on with walking, and own exercises by religiously following the exercise program                                                    |
| pain in lwr back keeps flaring up                                                                                                                                   | deal with the discomfort and get ready to go back to work following a strategically ste program of different type of exercises |                                                                                                                                 |                                                                                                                                                                                              |                                                                                                                                                                                                                          |                                                                                                                                          |

health problems such as  
headaches and sleeping

prescription drugs and  
sleeping pills

being able to do all  
aspects of life, quality of  
life, may have to live  
with it

lwr back back

managing pain

before

financial and  
physical

given to me by  
my kinesiologist

exercise and  
knowledge