THE EFFECT OF ENERGIZING ON STRENGTH PERFORMANCE

by

SUSAN. E. MOSSMAN
B.Sc., W.L.I.H.E., 1989

A THESIS SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTERS OF ARTS

In The School
of
Physical Education

We accept this thesis as conforming
to the required standard

[redacted]
Dr. B.L. Howe, Supervisor (School of Physical Education)

[redacted]
Dr. G. Van Gyn, Departmental Member (School of Physical Education)

[redacted]
Dr. D. Bachor, Outside Member (Dept of Psychological Foundations in Education)

[redacted]
Dr. B. Timmons, External Examiner (Dept of Psychological Foundations in Education)

University of Victoria

Supervisor: Dr Bruce L. Howe

ABSTRACT

The purpose of this study was to investigate the effect of a multi-treatment package of three recommended energizing techniques on the performance of a forearm strength task. The individual techniques were listening to music, taking a warm shower, and engaging in self-talk. Data were collected over a period of eight to ten weeks for seven female field hockey players ranging in age from 19-26 years. A modified version of the simultaneous treatment/continued baseline design in single subject research was implemented. The study consisted of four experimental phases, a baseline phase followed by the intervention phase then a return to baseline and a second intervention phase. During each session of the baseline phases two strength measures were taken with a five minute rest period in between. Subjects engaged in a cognitively distracting task (reading backwards) prior to each strength measure. The intervention phases followed the same format as the baseline phases but with the replacement of an energizing technique instead of reading backwards for the second strength measure. This allowed for the assessment of the effect of energizing on the second strength measure compared to the preceding continued baseline measure. For three of the five subjects who completed the study it was demonstrated that energizing was an effective method for producing consistently higher forearm strength performance over an eight to ten week period of strength training. Two subjects failed to demonstrate experimental effects. Several reasons were suggested to explain these results.

Several post hoc analyses were carried out to try and develop a clearer understanding of the phenomenon of energizing. In the first analysis it was found that strength performance did not appear to vary as a function of the perceived preferences in energizing techniques. The second analysis revealed energizing produced a perception of increased

strength regardless of outcome, hence, increased confidence to perform. Finally it was suggested that energizing resulted in emotional, physiological and cognitive change, but caution was expressed in assuming different energizing techniques produced the same energizing response. It was recommended that further research in the area of mental preparation to clearly operationalize concepts into their component elements in order to delineate the specific processes that underlie motor performance.

Examiners: [redacted]

Dr. B.L. Howe, Supervisor (School of Physical Education)

[redacted]

Dr. G. Van Gyn, Departmental Member (School of Physical Education)

[redacted]

Dr. D. Bachor, Outside Member (Dept of Psychological Foundations in Education)

[redacted]

Dr. B. Timmons, External Examiner (Dept of Psychological Foundations in Education)

TABLE OF CONTENTS

Abstract ii

Table of contents iv

List of Tables vii

List of Figures viii

Acknowledgements x

CHAPTER I: INTRODUCTION 1

Purpose of the Study 3

Operational Definitions 3

CHAPTER II: LITERATURE REVIEW 4

Mental Preparation 4

Studies of Mental Preparation and Performance 5

Theoretical Considerations 7

Physiological Based Hypotheses 7

Cognitive Based Hypotheses 10

Emotion Based Hypotheses 14

Review of Energizing Techniques 15

Listening to Music 17

Self-talk 22

Shower 24

Research Question 26

CHAPTER III: RESEARCH METHODS 27

Subjects and Setting 27

Instrumentation 29

Experimental Design 32

Testing Procedures 34

Data Analysis 37

CHAPTER IV: RESULTS AND DISCUSSION 39

Subject 1 40

Subject 2 51

Subject 3 63

Subject 4 75

Subject 5 88

Subject 6 88

Subject 7 88

Overview Discussion 100

CHAPTER V: CONCLUSIONS & RECOMMENDATIONS 108

REFERENCES 111

APPENDICES 118

List of Appendices 119

Appendix A: Informed Consent 120

Appendix B: Informational Questionnaire 122

Appendix C: Calibration of Cybex 124

Appendix D: Instructions for Energizing Techniques 126

Appendix E: Mood Adjective Check List (MACL) 128

Appendix F: Activation Deactivation Check List (ADCL) 130

Appendix G: Follow-up Interview 132

Appendix H: Pilot testing 138

Appendix I: Scheduling for Energizing Interventions 140

LIST OF TABLES

Table 1	Mean Strength Performance, Perception of Strength, Accuracy of Perception, and Heart rate for Subject 1 over trial 1 to trial 2.	43
Table 2	Changes in MACL Scores for Subject 1 as a Result of Self-talk, Shower, and Music.	52
Table 3	Mean Strength Performance, Perception of Strength, Accuracy of Perception, and Heart rate for Subject 2 over trial 1 to trial 2.	56
Table 4	Changes in MACL Scores for Subject 2 as a Result of Self-talk, Shower, and Music.	62
Table 5	Mean Strength Performance, Perception of Strength, Accuracy of Perception, and Heart rate for Subject 3 over trial 1 to trial 2.	69
Table 6	Changes in MACL Scores for Subject 3 as a Result of Self-talk, Shower, and Music.	74
Table 7	Mean Strength Performance, Perception of Strength, Accuracy of Perception, and Heart rate for Subject 4 over trial 1 to trial 2.	79
Table 8	Changes in MACL Scores for Subject 4 as a Result of Self-talk, Shower, and Music.	85
Table 9	Mean Strength Performance, Perception of Strength, Accuracy of Perception, and Heart rate for Subject 1 over trial 1 to trial 2.	92
Table 10	Changes in MACL Scores for Subject 1 as a Result of Self-talk, Shower, and Music.	97

LIST OF FIGURES

Figure 1	Experimental Design and Testing Procedures.	35
Figure 2	Mean Strength Performance for Subject 1 Across Experimental Conditions.	41
Figure 3	Strength of Trial 2 in Relation to Trial 1 for Subject 1.	45
Figure 4	Change in Activation Level from Trial 1 to Trial 2, with Music, Shower, and Self-talk for Subject 1.	48
Figure 5	Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-talk for Subject 1.	50
Figure 6	Mean Strength Performance for Subject 2 Across Experimental Conditions.	53
Figure 7	Strength of Trial 2 in Relation to Trial 1 for Subject 2.	57
Figure 8	Change in Activation Level from Trial 1 to Trial 2, with Music, Shower, and Self-talk for Subject 2.	60
Figure 9	Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-talk for Subject 2.	64
Figure 10	Mean Strength Performance for Subject 3 Across Experimental Conditions.	65
Figure 11	Strength of Trial 2 in Relation to Trial 1 for Subject 3.	68
Figure 12	Change in Activation Level from Trial 1 to Trial 2, with Music, Shower, and Self-talk for Subject 3.	72
Figure 13	Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-talk for Subject 3.	76
Figure 14	Mean Strength Performance for Subject 4 Across Experimental Conditions.	77
Figure 15	Strength of Trial 2 in Relation to Trial 1 for Subject 4.	80
Figure 16	Change in Activation Level from Trial 1 to Trial 2, with Music, Shower, and Self-talk for Subject 4.	84

Figure 17	Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-talk for Subject 4.	87
Figure 18	Mean Strength Performance for Subject 7 Across Experimental Conditions.	89
Figure 19	Strength of Trial 2 in Relation to Trial 1 for Subject 7.	91
Figure 20	Change in Activation Level from Trial 1 to Trial 2, with Music, Shower, and Self-talk for Subject 7.	96
Figure 21	Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-talk for Subject 7.	99

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Dr. Bruce Howe, for his guidance, support and extreme patience during the course of this study. I feel very lucky to have had the opportunity to have worked with him as my supervisor here at the University of Victoria. I would also like to thank the other members of my committee, Drs. Geri Van Gyn and Dan Bachor, for their insightful input.

Special thanks are extended to those members of the University of Victoria Field Hockey team who participated in the study. For their dedication, positive attitude and friendship which made this study a fun experience for me.

Also I would like to acknowledge my fellow graduate students and friends, especially P.J, Alex, Dave, George, John, Tami, Milena, Lynne, Linda, Val and Sue, for their input, support and for making my time here at the University of Victoria a truly great experience.

CHAPTER I

INTRODUCTION

At high level competition when the technical, tactical and physical preparation of athletes does not differ a great deal, it has been proposed that the main determining factor of performance outcome is the psychological state of the athlete (Terry, 1990). This belief has brought about the increased use of sport psychology principles in an attempt to assist athletes to reach their potential.

One of the assumptions of sport psychologists is that it is necessary for athletes to obtain an optimal psychological state along with physiological preparedness to achieve superior and more consistent performances. Loehr (1983) termed this mental and physiological condition as the "ideal performance state". There has been a considerable amount of writing in the general area of mental preparation on how to accomplish this state. Biddle (1985a, p. 71) defined mental preparation as "a cognitive strategy aimed at establishing a mental set allied to immediate performance enhancement". One of the popular terms used to describe the techniques in the area has been "psych-up". Some authors have distinguished "psych-up" as being a more immediate and intense cognitive strategy (Biddle, 1985a, 1985b; Weinberg & Jackson, 1985), although others have used it interchangeably with mental preparation (Shelton & Mahoney, 1978; Weinberg, 1982).

More recently, "energizing" has been posited as an important condition for athletes to recognize and reproduce before competition by several authors (Albinson & Bull, 1988; Botterill, 1986; Gauron, 1984; Harris, 1986). Loehr (1983) has suggested that being energized is the most important factor associated with achieving the ideal performance state. However, there has been confusion in the literature in defining the term precisely. There is some agreement that energizing is a more global process than psyching-up involving an

integration of cognitions as well as physiology and emotion (Botterill, 1986; Harris, 1986; Loehr, 1983). Nevertheless, with a lack of empirical research to support such claims, the terms of energizing and psych-up are often used synonymously. Thus, in the sport psychology literature it has been difficult to differentiate between the specific processes which have been researched as "psych-up" or mental preparation strategies from those which have also been described as energizing.

Rushall (1979) points out the importance of clearly operationalizing concepts into their component elements in order to delineate the specific processes underlying motor performance. One of the major problems as noted above has been that there has been no attempt to develop a clear definition of what energizing is or how it works. There have been three suggestions put forward to explain the mechanisms by which mental techniques produce an energized state and enhance performance. Harris (1986) considered it to be a physiological process, while Botterill (1986) suggested that self-confidence, a cognitive variable, was likely to mediate such effects. Finally, Loehr (1983) argued for an emotional basis. All of these authors suggested that there is a general energizing response achieved through these specific mechanisms.

There have been several mental techniques suggested as specifically contributing to producing an energized state. Botterill (1986), has identified listening to music or video tapes, taking a shower or massage, using energizing imagery, reciting cue words, physical action, meditation, breathing and drawing on external sources of energy such as crowd noise. These techniques have also been associated with other mental strategies such as attentional focus, relaxation, imagery, preparatory arousal and producing self confidence. However, to date there has been little empirical research specifically investigating if these techniques produce a general energized state or the effect of such a state on athletic performance.

Purpose of The Study

The primary purpose of this study was to investigate the combined effect of three suggested energizing techniques as a multi-treatment package on the performance of a strength task. The individual techniques were listening to music, taking a warm shower and engaging in energizing self-talk. A single subject research design was employed as recommended (Greenspan & Feltz, 1989; Kendall, Hrycaiko, Martin & Kendall, 1990) to observe the effects over time and to assess individual differences among the subjects.

A secondary purpose was to develop a clearer explanation of the phenomenon of energizing. Physiological, cognitive and emotional variables were measured to identify possible mechanisms through which an energized state effects performance change.

Operational Definitions

Mental Preparation: A cognitive strategy aimed at establishing a mental set allied to immediate performance enhancement, (Biddle, 1985a, p. 71)

Psych-up / Psyching-up: An immediate and intense cognitive aimed at establishing a mental set allied to immediate performance enhancement, (Biddle, 1985a, p.71).

Energizing: A combination of pre-performance preparation techniques designed to assist the athlete in creating the condition associated with good performance.

Strength Performance: Peak force attained (ft/lbs), after three maximal repetitions on the Cybex II Dynamometer.

Testing Session: A period of testing consisting of two strength test measures separated by a 5 minute recovery period.

CHAPTER II
REVIEW OF LITERATURE

In this chapter a review of relevant literature in the field of mental preparation is presented. The topics covered include a discussion of mental preparation, a review of studies of mental preparation and performance, theoretical considerations, and a review of the studies on the three suggested energizing techniques.

Mental Preparation

There has been experimental evidence corroborating the hypothesis that patterns of thought can influence subsequent performance (Bandura, 1977; Weiner, 1974). This could explain why in sporting situations many coaches go to great lengths to put their athletes in what they believe to be a proper state of mind. Weinberg (1982) cited the case of the legendary Notre Dame football coach, Knute Rockne, making an emotional appeal to his players at half-time of a big game to "win one for the Gipper", referring to George Gipp, an All-American for Notre Dame who was dying in the hospital with a fatal illness. The aim of the speech was to create a mental state in his athletes that would produce enhanced athletic performance.

As noted earlier in Chapter I, the pre-performance preparation of energizing comes under the general category of mental preparation. Although no research has specifically addressed the effects of energizing techniques many of the processes researched in the mental preparation literature are similar to those of suggested energizing techniques. Hence a review of the mental preparation literature will encompass some of the relevant issues to energizing.

Six different types of mental preparation strategies have been identified in the literature. Shelton and Mahoney (1978) identified four in their study of competitive weight lifters. These were statements of personal ability and self-efficacy, attentional focus, preparatory arousal, and imagery. These were confirmed by Weinberg, Gould and Jackson in 1980, who added relaxation as a technique. Finally, Caudill, Weinberg and Jackson (1983), identified the use of religious beliefs as a strategy in their investigation of mental preparation used by sprinters.

Studies of Mental Preparation and Performance

The first systematic attempt to investigate the effectiveness of mental preparation on motor performance was carried out by Shelton and Mahoney (1978). They found that after a period of psych-up, competitive weight lifters significantly improved their strength performance, as measured by a grip dynamometer, compared to a control group who were prevented from psyching-up by counting backwards. Weinberg, Gould and Jackson (1980) went on to investigate the effectiveness of psyching-up on different tasks. Their findings supported those of Shelton and Mahoney (1978) with dynamic isokinetic leg strength being improved in subjects who were mentally prepared. Weinberg, Jackson and Seabourne (1985), extended this finding to show improvement in muscular endurance and power. Mental preparation has been found to significantly effect sprinting (Caudill, Weinberg & Jackson, 1983), golf performance (Krischenbaum & Bale, 1984), basket ball performance (Kendall, Hrycaiko, Martin & Kendall, 1990; Wrisberg & Anshel, 1989), and skiing performance (Rushall, Hall, Roux, Sasseville & Rushall, 1988). However, mental preparation was found to have no effect for a stabilometer balance task, a speed of arm movement task (Weinberg et al, 1980), or on the performance of a tennis serve (Weinberg, Gould, Jackson & Barnes, 1980).

Another area of research has been to examine the comparative effectiveness of specific types of psych-up strategies. In their study, Gould, Weinberg and Jackson (1980) used a within-subject design study to compare the relative effectiveness of attentional focus, mental imagery, preparatory arousal, cognitive distraction (counting backwards) and a control rest condition in enhancing isokinetic leg strength. They found that preparatory arousal and the mental imagery conditions showed the greatest performance increases. In a follow-up experiment, the authors looked at preparatory arousal, imagery and control strategies in a between subject design. In the latter study they found the preparatory arousal group alone showed significant strength improvement. Preparatory arousal was also found to be the most effective mental strategy in improving strength performance by Caudill and Weinberg (1983), and Tynes and McFatter (1987). In a further study, enhanced self-efficacy was found to have similar significant effects to preparatory arousal in improving leg strength performance (Wilkes & Summers,1984). However, Wrisberg and Anshel (1989) found arousal strategies alone were not effective in improving basketball performance, although they were effective when combined with imagery.

Weinberg, Jackson and Seabourne (1985) looked at the comparative effectiveness of a non-specific psych-up condition, specific mental preparation strategies of imagery and preparatory arousal and a no-mental preparation control on four tasks of muscular strength, power and endurance. Both mental preparation conditions had significant improvements over the control group, but there was no difference between any of the specific strategies when compared with the non-specific strategy.

The relationship between strength performance and length of psych-up interval has also been investigated. Weinberg, Gould and Jackson (1981) looked at the effect of psych-up periods of 15 secs, 30 secs and a self initiated interval on strength performance. They found length of these psych-up intervals had no effect on the efficacy of the strategy. This

finding was supported by Caudill and Weinberg (1983) when they looked at varying psych-up intervals of 15, 30 and 60 secs on bench press performance.

In summary, some types of mental preparation have been demonstrated to have significant effects on athletic performance especially in relation to strength performance. The specific strategies of preparatory arousal, imagery and self-efficacy have been shown to be most effective. The length of psych-up interval has not been found to be important to the efficacy of the strategy.

Theoretical Considerations

It would appear that mental preparation can be beneficial for improving athletic performance, particularly with regard to strength tasks. There have been several hypotheses put forward to explain how mental preparation might benefit athletic performance.

Physiological Based Hypotheses

One theoretical explanation of how mental preparation can effect athletic performance has been through attaining an optimal level of physiological arousal in the athlete. There has been some debate as to what constitutes the optimum level of arousal. The majority of research investigating arousal level and performance on sport centers around demonstration of the Yerkes-Dodsen law of 1908, which has been used to predict an inverted U relationship between arousal and performance. The law predicted that performance increases with arousal up to an optimal point, after which increases in arousal become detrimental to performance. Oxendine (1970) extended the relationship, and hypothesized that gross motor activities, such as strength tasks, would require high levels of arousal for optimal performance, while complex motor skills would be facilitated by arousal levels

only slightly above that of resting. The optimal level of arousal is also believed to vary as a function of skill level, with higher levels of arousal being tolerated by athletes with a higher skill level (Cox, 1990). The existence of an inverted 'U' relationship, has been supported by Klavora (1977), and Sonstroem and Bernardo (1982). In general, authors have advocated it as the best representation of the arousal-performance relationship (Cox, 1990; Martens, 1974). However, Silva and Hardy (1984, p. 83) stated that "results taken collectively are at best equivocal".

An alternative physiologically based hypothesis has been the drive theory proposed by Hull (1951) and Spence (1956). It predicted a linear relationship between performance and arousal or drive, whereby increased arousal produces an increased level of performance of the dominant response. The theory explained the effect of arousal on learning and performance, where in the early stages of learning the dominant performance response is likely to be an incorrect one, hence increases in arousal result in poor performance. Whereas in the later stages when the dominant performance response is more likely to be the correct one, performance is enhanced with increases in arousal. Therefore, in a well learned skill, the higher the level of arousal the better. This theory has received criticism related to the difficulty in predicting habit hierarchies for different motor skills, meaning it is not possible to test some of the basic predictions of the theory (Martens, 1974). However, Landers (1980) believed that the reasons for abandonment of the drive theory are not well founded.

Gould, et al (1980) found that leg strength, power and endurance were significantly enhanced through preparatory arousal techniques where athletes were asked to "psych them selves up" and to get "emotionally charged". This finding has been replicated by Caudill and Weinberg (1983), Weinberg et al (1980), and Wilkes and Summers (1984). Such results have partially supported the drive theory prediction that increases in arousal will

result in increases in performance, although it could be argued that an insufficient level of arousal was reached to produce decreases in performance.

An explanation for the lack of definitive conclusions from either theory could be explained by the mixed use and poor operational definitions of arousal and emotional anxiety. The majority of research on the effect of arousal on performance has been limited to the investigation of anxiety on performance, where anxiety is measured through self-report paper and pencil measures. Derryberry and Rothbart (1988) have identified three components of arousal, (cortical, autonomic and endocrine), all of which may react independently of each other. Further, Mook (1988) reported that there are several types of stimuli, apart from anxiety shown to elicit increases in arousal such as, exercise, novel events, sensory input, other emotional stimuli and pain. Hence the measuring of anxiety and arousal through self report and the definitions of arousal as a form of anxiety seemed conceptually to be too loose. Research findings in the area have been understandably equivocal and have limited external validity or reliability.

A more promising approach recently has been to consider arousal as a multi-dimensional variable. Caruso, Dzewaltowski, Gill and McElroy (1990) investigated the psychological and physiological changes in competitive state anxiety during non-competitive and competitive success and failure. They concluded that state anxiety was a multi-dimensional construct with related components that are influenced differently by competitive conditions and task demands. This finding was supported by Gould, Petlichkoff, Simons and Vevera (1987), and Burton (1988), where somatic and cognitive arousal/anxiety were observed to have differing relationships with performance. The inverted 'U' relationship was observed for somatic arousal but followed the drive theory predictions for cognitive arousal.

An alternative view of arousal has been presented by Thayer (1989) who proposed that arousal consisted of two dimensions, an 'energetic' arousal, describing a sleep to energy continuum, and a 'tense' arousal describing a tension to placidity continuum. Douchamps, Heinz & Douchamps (1989) took a similar view point with the addition of a third 'cognitive' dimension of arousal, referring to the type of arousal required to perform cognitive tasks. They carried out a study exploring the behavioral changes in rowers following a marathon race and found that their tri-dimensional model of arousal was supported tentatively.

Another reported physiological explanation of enhanced performance through mental preparation stems from muscle innovation caused by mental strategies (Biddle, 1985b). This explanation is based on the psychoneuromuscular theory originally proposed by Carpenter (1894), as the ideo-motor principle, where subthreshold muscular contractions occur during the imagery of a desired performance in the muscle fibres to be utilized by the individual during actual performance. Corbin (1972) reported that kinesthetic feedback is thus provided to help form perceptual discriminations which could improve performance. However, Feltz and Landers (1983) reported that there has been a lack of quantitative studies testing the theory. Hale (1982) found such specific muscle innovation was not possible, and believed a more generalized neuromuscular effect occurs. He believed mental preparation would work through setting minimal arousal tension levels that would help prime the muscles for performance, in contrast to the deleterious performance effects associated with over arousal, as discussed earlier.

Cognitive Based Hypotheses

Although mental preparation techniques can be used to alter athletes' arousal in order to attain an optimal level, Biddle (1985b) in a review of literature on mental preparation and

strength performance, concluded that the effects of mental preparation are not explained through increased physiological arousal alone. This view was confirmed by Lee (1990) who looked at task-relevant and irrelevant psych-up techniques to increase sit-up endurance performance. She concluded that psyching-up strategies function through direct cognitive preparation for performance. This conclusion was also proposed by Murphy, Woolfolk and Budney (1988), and Wilkes and Summers (1984). There have been several explanations put forward to explain how cognitive preparation may result in improved athletic performance.

Wilkes and Summers (1984) suggested that mental preparation strategies produce increases in performance through focusing attention on the task to be performed. In performing a task an athlete is faced with certain attentional constraints. They stated that there is a limit to the amount of information to which they can attend and if they attend to the wrong information there will be interference to the successful performance of the task. Because of these constraints selective attention becomes a critical skill, involving the ability of the athlete to gate out or ignore irrelevant sensory information and to pay attention selectively to relevant information (Cox, 1990).

These arguments suggested that mental preparation functioned as a means of attaining a desired attentional focus. Therefore it could be used by the athlete to reaffirm the relevant cues to performance and focus on these cues. The techniques of thought stopping, centering and refocusing can be used to help the athlete control negative or irrelevant thoughts and restore attention to the relevant performance related cues. Weinberg (1982) reported that increases in arousal due to anxiety produce a narrowing and loss of flexibility in attention. This would result in athletes missing appropriate cues, hence mental preparation can be used to lower arousal which will indirectly allow the athlete to attend to all the relevant cues.

Association and disassociation strategies are other types of attentional techniques which have been reported to help the athlete to achieve an optimal attentional focus. Association is when the athlete internalizes attention to attend to the body's feedback, whereas disassociation is an external direction of attention which gates out sensory information from the body. The strategies have been used on the premise that due to an individual's limited informational processing capacity if attention is directed towards encoding information from one source there will be a decreased ability to encode the competing information. Hence attending to external cues would diminish the attention of internal cues (Weinberg, Smith, Jackson & Gould, 1984). There has been some debate as to which focus best aids performance. Gill and Strom (1985) demonstrated that athletes trained on a leg extension machine were able to do more repetitions if they used a dissociative strategy than if they used an associative strategy. Conversely, Morgan and Pollock (1977) believed that an association strategy was beneficial for elite marathon runners. Barber (1989) found no statistically significant effects for either disassociation or combined disassociation/association strategies when compared with a control condition on a 3200m run.

Biddle (1985b) reported that increased levels of self-efficacy and higher personal expectations are parts of another cognitive mechanism though which mental preparation strategies may be used to produce enhanced athletic performance. Self-efficacy refers to the conviction that one can successfully execute the behaviour required to produce an outcome (Bandura, 1977). Bandura demonstrated that increased self-efficacy resulted in increased task persistence and effort, which has been shown to result in improved performance. This finding has been replicated in the sports psychology literature by a number of authors (Feltz, Landers & Raeder, 1979; Gould & Weiss,1981; Lee, 1990; Weinberg, Gould & Jackson, 1981; Weinberg, Yukelson & Jackson , 1980). Bandura

(1977) identified four principle sources of an individuals self-efficacy expectations; performance outcomes, various experience, verbal persuasion, and physical arousal. Mental preparation could influence self-efficacy through the manipulation of any of these sources.

Another related concept to self-efficacy is that of personal expectations. Strength performance has been found to vary related to the expectations of the individual. It has been found that higher strength performance occurred when subjects were led to believe that the weight they were lifting was less than it's true value (Manzer, 1934; Nelson & Furst, 1972; Ness & Pattron, 1979). It was suggested that subjects were trying to match previous performance levels.

Dishman (1980) offered an alternative suggestion to explain the positive effects of mental preparation on athletic performance. He reviewed the literature on hypnosis in sport and exercise and suggested similarities exist between the explanations of the effects of hypnosis and those offered for strategies employing suggestibility in the waking state, i.e. positive self statements. He believed one similarity would be the break down of inhibitions to action. Increases in personal expectations brought about by mental preparation could result in a reduction of the central nervous system inhibition to maximal contractions. A decreased inhibition of muscle innovation would thereby result in an increased contraction with accompanying increases in the force output produced. Biddle (1985b) used this explanation to explain how enhancing personal beliefs could result in improved performance.

Symbolic learning is another cognitive explanation of how mental preparation may enhance motor performance. Mental preparation in the form of imaging a motor skill has been reported to give an athlete the opportunity to rehearse the sequence of movements as

symbolic representations of the task. Therefore imagery would facilitate performance through rehearsing temporal and spatial regularities of the skill (Feltz & Landers, 1983).

Emotion Based Hypotheses

Emotion has long been considered an important factor in motor skill performance (Oxendine, 1984). It's effects have been shown to operate separately from cognitive readiness (Lee,1990; Murphy, Woolfolk & Budney,1988), but many years of research have only begun to describe the nature and extent of its effects. Morgan and Pollock (1977) identified an emotional profile consistent for successful elite runners, rowers and wrestlers. It consisted of low scores on tension, depression, anger, confusion and fatigue and high scores on psychological vigor. This profile was termed the 'iceberg' profile and has since been replicated by several researchers (Morgan, 1979, 1980; Silva & Hardy 1984). Kavanagh and Hausfeld (1986) found differences in the performance of a strength task across induced sad, neutral and happy emotional states, the happy emotional state produced the best performance. This finding was replicated in anagram performance by Kavanagh (1987). However, Murphy, Woolfolk and Budney (1988), attempted to induce aggressive and anxious emotional states, and compared their effects on the performance of a strength task. No effect on strength performance over baseline or between states was found, although, there was no control for level of arousal (subjective or physiological), and no real evidence to support that they actually achieved the different emotional states. The performance measures themselves could also be questioned for failing to control for fatigue or learning.

There have been a few explanations suggested for the effects of emotion on athletic performance. Positive emotion has been reported to increase self-efficacy (Brown & Inouge, 1978; Weinberg et al., 1979,1980), which as discussed earlier could influence

what people feel they are capable of and their amount of effort and task persistence. Wilkes and Summers (1984), and Gould, Weinberg and Jackson (1980) hypothisised the arousal component of emotion would produce attentional narrowing, and thereby influence strength performance through enhanced attention. This arousal component of emotion could also be interpreted as influencing performance through the attainment of an optimal level of arousal as discussed earlier. Perceived exertion as a mediating variable has been related to subjective emotional experience by Rejeski (1985). Similarly, Hardy and Rejeski (1989) found positive affect expended during exercise at a high percentage of an individuals work capacity, enabled them to cope more effectively with the physiological strain of high performance.

Review of Energizing Techniques

Botterill (1986) described energizing as "any activity which results in feelings that one has reserve energy" (p. 2). It has also been described as the "integration of the mind-body feelings and thoughts that provide the athlete with a feeling of confidence of mastery and control" (Harris, 1986, p. 186). In contrast Loehr (1983) viewed energizing in a two dimensional conceptualization, (the level of intensity of the energy, and the extent to which the energy experience was pleasant or unpleasant). The only agreement areached in the literature has been a general description that energizing is a type of mental preparation aimed at providing athletes with a technique to manipulate their internal conditions of cognitions, physiology and emotions so that they can create the optimal conditions associated with good performance.

The lack of consensus for a definition of energizing has been mirrored also in the varying hypotheses that have been put forward to explain how energizing techniques may produce an energized state and enhance performance. Harris (1986) took the approach that

energizing techniques worked in the reverse to relaxation. Energizing is used to increase an athletes arousal to an optimum level, as opposed to reducing it through relaxation techniques. She reported that the optimum level of arousal was a combination of mind-body feelings and thoughts, and that such a condition could be achieved via two routes, muscle to mind, (e.g. physical warm-up), or mind to muscle, (eg. meditation). She believed that regulating arousal was simply a matter of programming. Once an athlete has learned to identify which mental-emotional and bodily states and feelings accompany superior performance, he or she could learn to "program" these responses voluntarily to set the stage for another superior performance.

A multi-component view of energizing was supported by Botterill (1986). He explained the performance enhancement qualities of energizing to the achievement of an optimal performance state, an increased confidence in ability to read and respond to environmental stimuli, and an enhanced feeling of mastery and control. He related the attainment of an energized state to Glasser's control theory of behaviour (1984). Glasser reported that total behaviour at any given time would involve four components; physiology, feeling, thinking and doing. He considered that to change any total behaviour all that is needed is to alter one or more of the four components. Therefore energizing techniques which involved these components like listening to music, self-talk or taking a shower could serve as possible mechanisms to evoke such changes.

Gauron (1984) related energizing to the oriental concept of energy, 'Ki', which he interpreted as the inner vital force through which everybody expresses themselves in all actions. He rationalized that Ki is not a quantifiable entity to be acquired, rather it is something we already have that needs to be controlled. Hence, Gauron's energizing techniques are based on learning to experience personal energy throughout the body and developing the ability to tap into the energy on demand.

The divergence of opinion may be due to the lack of empirical research investigating the notion of energizing, what it is or how it works. To date, the definitions of energizing are unclear and explanations of energizing together with the proposed benefits appear to be based on purely anecdotal evidence. However, some strategies commonly have been proposed as particular examples of energizing to improve readiness for performance. Among these have been the techniques of listening to music, self-talk and taking a shower (Botterill, 1986). These were the techniques selected for analysis, and are reviewed below.

Listening to Music

Listening to music has been prescribed as an energizing technique by several sport psychologists (Botterill, 1986; Gauron, 1984; Harris, 1986). They have suggested that athletes should find a piece of music which is inspirational and activating to them for use prior to performance.

Music has often been used in the context of preparation for sport. For example, sporting ceremonies and competitions, including the Olympics, are often started with a musical introduction (Hohler, 1989) and many individuals choose to listen to music while exercising (Boutcher & Trenske, 1990). Apart from these modern examples the use of music to encourage human action is not a new phenonomon. Primitive African tribes developed highly complex musical rhythms to accompany physical rituals such as war dances (Gaston, 1951). In the age of slavery, work songs were sung to help endure the physical hardship. Music has also had a long association in the military to help regulate marching (Hohler, 1989). Recently the positive effects of music have been investigated more systematically. It has been shown to reduce depression (Pignatiello, Camp & Rasar, 1986), to help manage stress (Biller, Olson & Breen, 1974; Rider, Floyd & Kirkpatrick,

1985), and to act as a distraction strategy to decrease the sensation of pain during dental procedures (Corah, Gale, Pace & Seyrek, 1981).

In the realm of physical activity there has been a small amount of research into effect of music on athletic performance. Gfeller (1988) surveyed 70 college students from 18 to 30 years old, who were involved in aerobic fitness activities. Subjects indicated that music aided performance through a combination of temporal and quantitative factors aiding strength and endurance. They felt it assisted their performance by contributing to a positive mental attitude towards physical activity, providing motivation, and acting as a distractor from unpleasant stimuli. The positive effect of music on performance was supported by Beckett (1990) who found subjects who were exposed to either intermittent or continuous music during 30 minutes of walking at an aerobic speed had significantly better recovery heart rates and exercised for a greater distance. Performance in a submaximal cycle ergometer endurance test was improved by exposure to music, (Anshel & Marisi, 1978). In their study subjects cycled to music either synchronous or asynchronous and to no music at all. The synchronous music lead to superior performance compared to no music or asynchronous music.

Boutcher and Trenske (1990) found that music had differing effects on perceived exertion and affect, dependent on the intensity of the exercise. Subjects cycled on an ergometer for 18 minutes at an intensity of 60, 75 and 85% of maximum. They found that in the low intensity cycle, music led to lower perceived exertion compared to a sensory deprivation condition, whereas in the moderate and high intensity cycles music produced more positive affect than the deprivation or control condition. Perceived exertion effects were related to the distracting characteristics of music, whereas the positive affect was discussed in terms of music resulting in increased arousal and mood induction. The differing effects of music related to the intensity of the activity is also evidenced by a study

carried out by Nelson (1963). He failed to find any significant performance effects of selected music, pure tones and varying intensity, on a 90 sec maximal exertion cycle ergometer test. This was in contrast to the performance effects found by Anshel and Marisi (1978) in their submaximal test. Interestingly, the subjects in Nelson's maximal test reported that the music made them feel better, which was supported by Boutcher and Trenske (1990).

The effect of music in relation to strength performance has also received some attention. Pearce (1981) compared the effect of stimulative with sedative music on grip strength performance and found sedative music produced a significantly poorer performance. Music was also found to have a significant positive effect on push-up performance (Koschak, 1975).

It would appear that music can serve several different functions in helping to enhance physical performance. In previous research its effects have been attributed to attentional distraction (Anshel & Marisi, 1978; Boutcher & Trenske, 1990) increases in arousal or activation (Pearce, 1981), emotional change (Beckett, 1990; Boutcher & Trenske, 1990), and as a temporal cue to regulate action (Anshel & Marisi, 1978; Gfeller, 1988).

The explanation of music aiding performance by being an attentional distractor from unpleasant stimuli associated with high intensity exercise could be explained through limitations in an individuals information processing capacity (Kahneman, 1973)). According to the theory, the nervous system can attend only to limited environmental stimuli at any one moment while omitting other extraneous and unpleasant stimuli. Thus, the ability of an individual to endure a physical task based on pleasurable auditory stimuli of music may be explained by the blocking of sensory transmission in one pathway to facilitate the transmission of electrical activity in another afferent pathway. Marteniuk (1976) went further to suggest that an individual's perception of a pleasant auditory stimuli,

such as music, would predominate over the individual's attention to other less pleasant stimuli associated with physical effort.

More recently this theory has been used by Rejeski (1985) in the investigation of perceived exertion and physical performance. The author used the theory to help develop his own model of parallel information processing, in which he suggested that sensory and emotional information are preconsciously processed in parallel, resulting in information being filtered through to focal awareness. In a heavy work out, sensory information such as a fast heartbeat, and affective information such as the apprehension caused by the heavy work load can form the object of attention and determine perceived exertion or an individual's affective state. Therefore, competing stimuli such as music have the potential to influence both perceived exertion and affect by occupying attention which in turn can effect performance. The potentially powerful role music can play as a distraction strategy has been demonstrated by Corah, Gale, Pace and Seyrek (1981) when they used music to decrease the sensation of pain during dental procedures. Music was also used as a distractor to physical exertion by Barber (1989) in his study on middle distance running. He found a group distracted by music ran 3200m , 23 secs faster than the control group, which would equal a distance of approximately 200m. Although this difference was not statistically significant, it would be important in a competitive situation.

As discussed earlier, much attention has been given to develop theories which relate the level of arousal to physical performance. If music brings about changes in arousal it is indirectly effecting physical performance. There have been several pieces of research which demonstrate how listening to music produces changes in a number of measures of autonomic arousal. Galvanic skin resistance (GSR), has been shown to be affected by music. Soothing music significantly lowered the GSR while exciting music raised it (Peretti, 1975; Zimny & Weidenfeller, 1963). Heart rate has been found by several authors

to be influenced by music (Barger, 1979; Beckett, 1990). However, neither Ellis and Brighouse (1952) or Zimny and Weidenfeller (1963) were able to show a significant effect of music on heart rate, although Ellis and Brighouse (1952) demonstrated respiration rate was significantly increased when listening to music. Sears (1960) found music to be effective in changing muscle tension in accordance with music types.

Alterations in emotional state has been one explanation on how music produces changes in physiological arousal. It has been shown that changes in an emotional state are accompanied by changes in physiological arousal, hence the response in physiological arousal could be through emotional change provoked by exposure to music.

Music has been used successfully to induce differing emotional states by Smith and Morris (1976) who exposed subjects to stimulative, sedative and no music conditions before and after five sections of a multiple choice test. Stimulative music was found to significantly increase worry emotionality while sedative music had no effect on anxiety relative to the control group. Music has also been found to induce differing emotional states by Biller, Olson and Breen (1974), Smith and Morris (1977), and Sutherland, Newman and Rachman (1982). Pignatiello, Camp & Rasar (1986) advocated the use of music as an alternative to the Velten (1968) word association technique of mood induction. The mechanism by which music produces the emotional change is not clear. Hohler (1989) suggested it is the basic qualities of sound, intensity, amplitude, continuance, and colour which produce the wide scale of emotional responses. The emotional change was explained as a combination of either physiological reactions, by attitudinal change through appreciation of the music, or through association with the meaning or values interpruted in the music. More recently, Gfeller (1988) related the phenomenon of 'extramusical association'. Subjects reported that music, such as the theme from the movie Rocky, brought about inspirational memories associated with people triumphing over adversities.

The final explanation on how music may effect physical performance is by acting as a temporal cue, regulating movement through a reaction to rhythmically organized sound. In a survey carried out by Gfeller (1988), 79% of the individuals surveyed indicated that they used the rhythm and tempo of the music to cue temporal aspects of movement. This is supported by the fact that the three most frequent preferred styles of music had both strong and regular rhythmic features. Gaston (1951) made an early attempt to try and determine what the dynamic factors of music were. He concluded that staccato, a short detached, percussive rhythm, was the driving factor in music which stimulates muscular action and induces bodily action. Nelson (1963) emphasized how important a properly established rhythm is for successful performance, of the middle distance runner who grinds out an efficient rhythmical pace to achieve a fast race time. Thaut (1983) concluded that a rhythmic auditory stimulus can aid temporal precision and increase endurance by serving as a predictable time cue and auxiliary feedback system. According to Pearce (1981) rhythm patterns have the potential to increase or suppress muscular endurance and control during physical exercise. Finally Gfeller (1988) reported how rhythmical patterns can act as cues for regular breathing, thus helping to guard against deoxygenation that can occur if an athlete fails to breath regularly during physical activity.

Self-talk

Self-talk is prescribed as an energizing technique by a number of sport psychologists (Albinson & Bull, 1988; Botterill, 1986; Gauron, 1984; Harris, 1986). These authors suggested that athletes should develop a dialogue of cue words which they find energizing and then to focus on these words when they require more energy. The concept of self-talk and athletic performance has received some attention in the research literature. Rushall, Hall, Roux, Sasseville and Rushall (1988) found that self-talk in the form of task relevant

cues, mood words and positive self-statements, were all effective in improving cross country skiing performance, when compared to a control 'normal' skiing condition. Improvement in leg endurance performance with the use of positive self-statements was reported by Weinberg, Smith, Jackson and Gould (1984), and Wilkes and Summers (1984). Ergometer rowing performance was found to be significantly improved with the use of mood words (Rushall, 1985). Further, Ziegler (1987) demonstrated the positive effect of a four stage verbal cueing program for improving tennis ground stroke returns. However, Weinberg, Gould, Jackson and Barnes (1980) failed to show any effect of positive self-talk in facilitating tennis serve performance. Similarly Weinberg et al (1984) found positive self-talk to have no effect on the performance of a 30 min run, and Weinberg (1985) found no effect on a leg muscular endurance task.

Self-talk also has been found to be effective when used in combination with other performance enhancing techniques. Kendall, Hrycaiko, Martin and Kendall (1990) looked at the effect of a package of imagery, relaxation and self-talk on the performance of a specific defensive basketball skill. They used a single subject, multiple baseline design, and found the intervention package to be clearly effective across all subjects. Others who have demonstrated self-talk to be effective in combination with other strategies include Krischenbaum and Bale (1984) on golfing performance and Wrisberg and Anshel (1989) on basketball free throw shooting.

There have been several suggestions put forward with regard to how self-talk may enhance athletic performance. The most common explanation has been through the mechanisms of self-efficacy. Weinberg (1985) reported that positive self-statements increase one's belief that they can effectively execute the required behavior thus increasing their level of perceived self-efficacy. However, Rushall et al (1988) found that neither

expectations nor belief were responsible for their self-talk effects in their study of three types of thought content instructions on skiing performance.

Self-talk has been thought to influence performance through helping the athlete focus attention on task relevant cues. Kendall et al (1990) supported this explanation when they investigated the effect of self-talk in combination with imagery and relaxation on basketball performance. Wrisberg and Anshel (1989) found the Benson (1980) relaxation technique, which involved focusing on a cue word, to aid free throw shooting performance. This supported Nideffer's (1985) belief in the importance of focusing on task relevant cues after relaxation. Finally, Ziegler (1987) found a four step verbal cueing program very effective in enhancing ground stroke performance in tennis, and reported that the self-talk acted effectively through stimulus cueing.

Another explanation for the positive effect of self-talk has been reported as a generation of increased effort by the athlete. Rushall et al (1988) explained improved cross country skiing performance accompanyied by self-talk, at least in part, as a result of increased effort as measured by post trial heart rate.

Harris (1986) described increased arousal up to the athlete's optimal level as the final explanation on how self-talk could produce it's effects. She describes the use of energizing cue words as a means to increase arousal and reduce the feelings of fatigue. The increases in post exercise heart rate found by Rushall (1988) could be interpreted as increases in arousal to increase effort.

Shower

Botterill (1986) described taking a shower as a way to help athletes feel energized. There are a few examples of athletes using showers as a pre-performance preparation, Graham Smith, a member of the Canadian swim team and winner of six gold medals in

1978, described how he used a warm shower directly before competing as part of his pre-performance competitive strategy (National Coaching Certification Program Video, Module 11 & 12, 1980). Showers have also been reported to be part of the pre game preparation of many tennis players, who shower and change into a fresh set of clothes after warm-up (Weinberg, 1988). Despite this anecdotal evidence for the use of showers, there has been no empirical evidence to demonstrate or explain its effectiveness.

Research in this area has been limited to the physiological effects on performance of extreme hot or cold water on the body. Lamb (1984) stated that an increase in muscle temperature will aid strength performance through increasing the contractile strength and speed of the muscle. With increased muscle temperature nerves conduct impulses more rapidly and the connective tissues become more pliable. However, Lamb reported that taking a hot shower for just a few minutes would be of sufficient duration only to warm the skin but would not have time to penetrate through to warm the muscles, which would be necessary for the reported increases in strength to occur.

The only possible cognitive explanation of how taking a shower could benefit athletic performance was suggested by Orlick (personal communication, April 1991) who believed taking a shower could act as stimulus for refocusing.

RESEARCH QUESTIONS

Based on the current research findings, the following research question and post hoc analyses were carried out.

Research Question

1. Will forearm strength performance be improved through the combined effect of three energizing techniques, listening to music, taking a shower and engaging in self-talk?

Post Hoc Questions

1. Will the effectiveness of energizing be related to individuals perceived preferences in pre-performance preparation?

2. Will energizing produce a perception of increased strength?

3. Does energizing result in cognitive, physiological or emotional change?

CHAPTER III
RESEARCH METHODS

The research methodology and procedures that were used in the study are reported in this chapter. The subjects and setting, instrumentation, experimental design, testing procedures, data analysis and rationale for research design are presented.

Subjects and setting

Seven female field hockey players from the University of Victoria volunteered to participate in the study. All subjects signed an informed consent form (see Appendix A) and an information questionnaire (see Appendix B). Two subjects were unable to complete the study because of injury and outside commitments. Testing sessions were held in the University of Victoria sport and fitness testing center, with each subject being tested at the same time of day for each session. The characteristics of each subject are presented below as individual details are an important part of the single subject design.

Subject 1

Subject one was 20 years old and in her third year of study in an arts and science program. She was 5'4" tall and weighted 125lbs. She had been playing field hockey for seven years as a forward. She had not participated in any formal strength training program.

Subject 2

Subject two was 19 years old and in her second year of study in an arts and science program. She was 5'2" tall and weighed 125lbs. She had been playing field hockey for

four years as a half back and was a junior national level player. She had not been involved in any formal strength training program.

Subject 3

Subject three was 22 years old and in her fifth year of study in education. She was 5'4" tall and weighed 120lbs. She had been playing field hockey for seven years as a right wing and was a junior national level player. She had been involved in a formal strength training program for three years.

Subject 4

Subject four was 21 years old and in her fourth year of study in education. She was 5'7" tall and weighed 143lbs. She had been playing field hockey for nine years as a forward and was a national team player. She had been involved in strength training for five years.

Subject 5

Subject five was 26 years old and in her second year of the graduate program in physical education. She was 5'7" tall and weighed 138lbs. She had been playing field hockey for twelve years as a forward and was a senior national level player. She had been involved in a formal strength training program for one year. Subject five dropped out of the study in week four because of other commitments.

Subject 6

Subject six was 22 years old and in her fifth year of study in physical education. She was 5'9" tall and weighed 145lbs. She had been playing field hockey for eight years as

defender and was a junior national player. She had been involved with strength training for five years. Subject six was forced to drop out after the third testing session as the strength task aggravated a shoulder injury.

Subject 7

Subject seven was 22 years old and in her fifth year of study in physical education. She was 5'9" tall and weighed 155lbs. She had been playing field hockey for seven years in midfield and was a national level player. She had been involved in a formal strength training for one year.

Instrumentation

1. Information Questionnaire: This questionnaire provided information regarding each subject's age, height, weight, contact telephone number, the number of years playing, the highest level of field hockey achievement, position played, involvement in strength training, and academic program (see Appendix C).

2. Strength Task: The isokinetic strength of the non dominant forearm was measured on the Cybex II Dynamometer. Strength performance was assessed by the peak force attained (Ft/lbs) for pronation (inward movement toward the body) and suprination (outward movement away from the body) of the forearm over three maximal effort repetitions. The test-retest reliability of the Cybex II dynamometer is .96 (Patton, Hinson, Arnold & Lessard, 1978).

Calibration of the force measurements by Cybex II dynamometer was carried out at the start of the study, four weeks into the study and at the conclusion of the study (See Appendix D).

3. Energizing Instrumentation: Subjects received written instructions outlining the energizing techniques they would be using (See Appendix E).

3.1. Music condition: Subjects brought along music which they felt was energizing to them. The selection was played through head phones to allow for a focused exposure to the music. The music was played for the 5 mins preceding the strength task it was removed as the subject was directed to commence the strength task.

3.2. Shower condition: Subjects took a shower at the preferred temperature which they felt would best energize them for performance. The shower room was located just outside the testing lab, and it took subjects approximately 20 seconds to walk at a leisurely pace to the shower room, where they proceeded to take a shower for approximately 2 minutes, at that time the tester signaled by knocking on the door that there were 2 minutes left. Subjects then dried and changed and returned to the testing lab.

3.3. Self-talk condition: Prior to the self-talk intervention subjects were instructed to compose a list of words which came to mind when they thought of energy, power, strength and performing maximally. From this list two or three of the words which were the most personally meaningful to the subject and had power associations with feelings of excellence, were selected (Albinson & Bull, 1988).

4. Cognitively Distracting Task: A cognitively distracting task was used prior to baseline measures of strength performance. Wrisberg and Anshel (1989) suggest that a task such as reading a passage would prevent mental preparation. The task decided on after piloting the research procedures was to read backward from a text book starting from the bottom of the page.

5. Energized State: To assess the energized state the following measures were taken.

5.1. Physiological arousal/activation: Heart rate (HR) was monitored continuously via a Sports Tester heart rate monitor. HR has been an accepted indicator of anatomical nervous system arousal (Dimberg, 1989) and as an indicator of emotional arousal (Myrtek. et al. 1988). An electrode transmitter was attached to the subject's chest, from which the subjects heart rate information was transmitted and recorded on a computerized watch for later data analysis.

5.2. Self Report (Subjective experience) measures: During the last two weeks of testing, subjects completed self-report tests, prior to and following intervention to monitor changes in mood state and perceived activation level as a result of the intervention.

5.2.1. The short form of the Mood Adjective Check List (MACL) developed by Nowlis (1965), was used to measure the subjects' general affective state along 12 dimensions; aggression, anxiety, concentration, egotisim, elation, fatigue, sadness, scepticism, social affect, surgency, vigor and nonchalance, (see Appendix F). Test-retest reliability of the MACL has been found to range from .50 to .80 by Nowlis (1965).

5.2.2. The Short-form Activation-Deactivation Adjective Checklist (AD ACL) developed by Thayer (1978), was used to measure the transitory activation of arousal states. The high activation (feelings of tension and anxiety), and general activation (feelings of calm and relax) subscales of the adjective checklist were used to assess the subjects perceived level of arousal (see Appendix G). Test-retest reliability of the checklist has been found to be .93 and .89 for each of the subscales respectively (Thayer, 1978).

5.3. Follow-up Interview: Each subject had a follow-up interview developed by the researcher to gather information describing the subjects' thoughts and feelings about each of the energizing techniques. This assessed the importance of personal beliefs in relation to the effectiveness of the energizing techniques and the degree to which each of the

techniques influenced the subjects' perceived focus of attention, arousal level, confidence and effort (Appendix H).

Experimental Design

This study incorporated a single subject research design. This type of design has been used extensively in the field of behavioural psychology and has now recently been introduced to the field of sport psychology (Bryan, 1987; Woolman, 1986; Zaichowsky, 1980). The underlying rationale of single subject research design is to make inferences about the effects of an intervention by comparing different conditions presented to the same subject over time (Kazdin, 1982). A common description of single subject design has been the recording of a large amount of data on a small number of subjects, as compared to group designs which record a little data on a large number of subjects.

Bryan (1987) outlined several advantages that are inherent in single subject research design. He stated that in group design results for all subjects are averaged together and statistical significance is relied upon to evaluate the effectiveness of the intervention. However, if the intervention had been successful for a small number of the individuals, this potentially valuable finding would be missed. Also, single subject research design allows for individual differences to be considered across subjects, successful effects for certain individuals can be detected whose success might otherwise be masked by non-significant group averages. Since a large amount of data can be collected with small numbers of subjects, a close examination of the characteristics of the successful individuals is possible. Each subject acts as their own control, eliminating the sometimes ethical issue of control groups. Further, because each subject acts as their own control only a small number of subjects are needed to investigate the effect of an intervention which is valuable for researching the elite athletic population whose numbers will be small. A final advantage

reported was that in the evaluation of the elite athletes single subject design can detect small but significant changes over time, a magnitude which is more likely with the high performance standards of the elite.

Bryan (1987), Woolman (1980) and Zaichowsky (1980) all recommended the use of single subject research design for many of the reasons discussed above. Kendall et al. (1990) argued that the use of single subject evaluations of mental training interventions is important to extend the literature in this area. Because of these examples and the nature of this study where individual differences and variability were perceived as being important, single subject research design was deemed the most appropriate experimental design.

The specific design used in this study was a modified version of the simultaneous treatment / continued baseline design (Kazdin, 1982). The design allows the assessment of baseline behaviour simultaneously with intervention behaviour. This characteristic has led to several reported advantages in research analysis. The magnitude of change due to the intervention can be judged from the continual baseline behaviour. Extraneous influences that might be confounding with the onset of the intervention can be taken into. Also, it has been reported that the design allows for assessment of behavior change even when baseline behaviour is unstable or shows a trend that would ordinarily interfere with the evaluation of the intervention.

The design was modified in that the baseline behaviour and the intervention behaviour were assessed in the same testing session instead of on different sessions as reported elsewhere (Kazdin, 1982). This was necessary because the variable of interest was the difference between strength performance on a single occassion rather than across different occasions. It was possible to make this modification because of the nature of the intervention which was applied being of a performance enhancing nature with a relatively immediate yet temporary effect. Hence, it was possible to obtain in one testing session

baseline information on the target behavior, (strength performance), as well as information on the effect of the interventions, (energizing techniques). It was not possible to randomize the order of the testing periods, in that baseline measures were always followed by intervention measures at each testing session. However, a reversal phase in which two baseline measures were taken (as in the original baseline phase) was included to add to the demonstration of experimental control as in an ABAB design (Kazdin, 1982).

The continuous monitoring of baseline strength performance allowed evaluation of day to day variability and overall increases in strength performance over time. In addition, because the different intervention energizing techniques do not have a contaminating effect toward each other, they could be presented in superseding sessions in a random order. The design consisted of four phases; a baseline phase, an intervention phase, a return to baseline phase and a second intervention phase.

Testing Procedures

1. Introductory session: Subjects attended an introductory session aimed at familiarizing them with the equipment and procedures. Informed consent forms were signed and collected at this session.

	Baseline	Intervention 1	Baseline 2	Intervention 2
Weeks	1-2	3-5	6	7-8
Testing protocol				
Trial 1	RB T_1	RB T_1	RB T_1	RB T_1
	<---------- 5mins Recovery ---------->			
Trial 2	RB T_2	**EZ** T_2	RB T_2	**EZ** T_2

T_1 = First strength test measure.
T_2 = Second strength test measure.

RB = Reading Backwards
EZ = Energizing

Figure 1

Experimental Design and Testing Procedures

2. Baseline phase: The baseline phase consisted of five to ten days of baseline strength performance. At each session the subject was allowed three to four warm-up repetitions. This warm-up period was followed by two baseline strength measures (see Figure 1). Each strength test involved six maximal effort repetitions with the forearm, (pronation followed by suprination). The two strength tests were separated by five minutes of rest. This time period was determined after considering muscle energy store replenishment and different rest intervals based on pilot testing experience (see Appendix I). During the rest period the subject was unstrapped from the Cybex and gently opened and closed their fist, to aid recovery. Prior to each strength test a cognitively distracting task was carried out to eliminate the use of any type of mental preparation. Subjects wore a Sports Tester heart rate monitor which continuously recorded heart rate. Immediately prior to the first test and immediately after the second test the subjects completed the 10 point likert scales to measure the perceived level of energy and to what extent that energy was pleasant or unpleasant. Once the test measures were collected, subjects participated in a further work out aimed to ensure increased forearm strength over the testing period.

The purpose of the baseline phase of the experiment was to predict how the target behaviours would have been if no intervention had been implemented.

3. Intervention phase: For the intervention phase the same procedures as the baseline phase were used, except that prior to the second strength test measure an intervention was introduced instead of the cognitively engaging task. The intervention was one of three energizing techniques, listening to music, taking a shower or self-talk (see instrumentation section). The purpose was not to examine the individual treatment effects of the three energizing techniques, but the combined treatment efficacy of these energizing techniques as a multi-treatment intervention. The time interval for the intervention was the same as the

rest period in between the two test measures of the baseline phase. The three energizing techniques were presented in a random order in five, three-day cycles, (Appendix K). Each of the subjects received the intervention in a different random order, thus an order effect of the interventions was negated due to the counterbalancing of the interventions during each of the 3 day cycles.

4. Return to baseline: A four to six day return to baseline phase was introduced mid way through the intervention phase. This was to demonstrate that experimental control had been maintained.

Data Analysis

The data were analyzed using visual inspection of the graphed results. The criteria used to inspect the data were those recommended by Kazdin (1982) and included stability of the strength performance data, magnitude of change in the means across phases and the rate of these changes through inspection of trends and latency of the changes. The stability in the strength performance data provides information on how reliable predictions could made from performance, if no intervention had been implemented. Changes in mean performance reveal the shifts in the average rate of target behaviour across experimental phases and how the target behavior changed as a result of the intervention. Changes in trend of the strength performances reflect any systematic increases or decreases in behavior over time. The latency of change is the period of time between the onset or termination of one condition and changes in performance.

The analysis was carried out in two parts. First, the overall pattern of results across phases was examined in a typical ABAB analysis, where treatment efficacy is determined by comparing treatment to baseline results (Kazdin, 1982). Changes in magnitude in the

mean strength performance across phases were assessed, and the rate of such changes were assessed through inspection of trends and any latency of change. The second analysis took advantage of the design characteristic of a continued baseline with two trials as measured per session across all experimental phases. Because the intervention was performance enhancing in nature with a relatively immediate yet temporary effect, it allowed for baseline information on strength performance as well as information on the effect of energizing to be measured over two trials in one testing session. This allowed assessment of baseline behaviour and intervention behaviour simultaneously, as is typical of a continued baseline design (Kazdin, 1982). Hence, magnitude changes were assessed through differences in mean performance shifts of Trial 1 compared to Trial 2, and were supported through the analysis of the proportion of cases where Trial 2 became relatively stronger than Trial 1. Rate of change was assessed through analysis of trends in the difference of strength performance of Trial 1 compared to Trial 2 over time, and latency of change was assessed by examining whether the changes occurred immediately.

Descriptive statistics were used to assess the post-hoc results. Means and percentages of occurrence were calculated across phases and types of intervention. Descriptive information was collected from a post study interview and from inventories assessing emotional state and activation level.

CHAPTER IV
RESULTS AND DISCUSSION

This chapter is a summary of the results of the five subjects who completed the testing together with a discussion of each subject's results. Results will be presented in the same order as the research questions under investigation.

Research Question

1. Will forearm strength performance be improved through a multi-treatment package of three energizing techniques, listening to music, taking a shower and engaging in self-talk?

The following format is used in the examination of whether strength performance had been improved through energizing as discussed on pages 36-37. First, overall patterns in strength performance across phases were examined. This included changes in magnitude of mean strength performance and rate of change which was assessed by changes in trend and latency of changes.

Second, patterns in strength performance from Trial 1 to Trial 2, across phases were analyzed. This included the stability of results which were assessed through the consistency of patterns. Change in magnitude of the mean performance shifts of Trial 1 compared to Trial 2, supported further through an examination of changes in the proportion of sessions where Trial 2's performances became relatively stronger compared to Trial 1. Also, rate of change through inspection of trends and latency of changes in the difference in strength performance of Trial 1 compared to Trial 2 over time.

Post Hoc Questions

Separate post hoc analyses were carried out to examine the following questions:

1. Will the effectiveness of energizing be related to each individuals' perceived preferences in pre-performance preparation?
2. Will energizing produce a perception of increased strength?
3. Will energizing result in cognitive, physiological or emotional change?

Post hoc analyses were carried out on subjects where energizing was shown to have been effective in enhancing strength performance, with the exception of post-hoc analysis number two which was deemed relevant in all cases regardless. The analyses were prepared from the information gathered in the post study interview, the questions asked during the testing sessions, and from the results of inventories given to the subjects to assess emotional state and activation level as a result of energizing and heart rate data collected at each testing session.

Subject 1

1. Will forearm strength performance be improved through a multi-treatment package of three energizing techniques, listening to music, taking a shower and engaging in self-talk?

Overall patterns in strength performance across phases were examined, not looking at differences between trial's one and two. Visual inspection of Figure 2 shows there was considerable variability in strength performance across all four phases of the study, with an overall increase in strength performance from Session 1 to Session 27. This increase in strength performance was an anticipated result following eight weeks of strength training. The introduction of energizing in the first intervention phase was accompanied by an increase in magnitude in the average strength performance over the baseline phase for both Trials 1 and 2. With the withdrawal of energizing in the second baseline phase there was a decrease in magnitude of mean strength performance together with a decrease in trend. In other words, strength performance showed a steady decrease over time. This

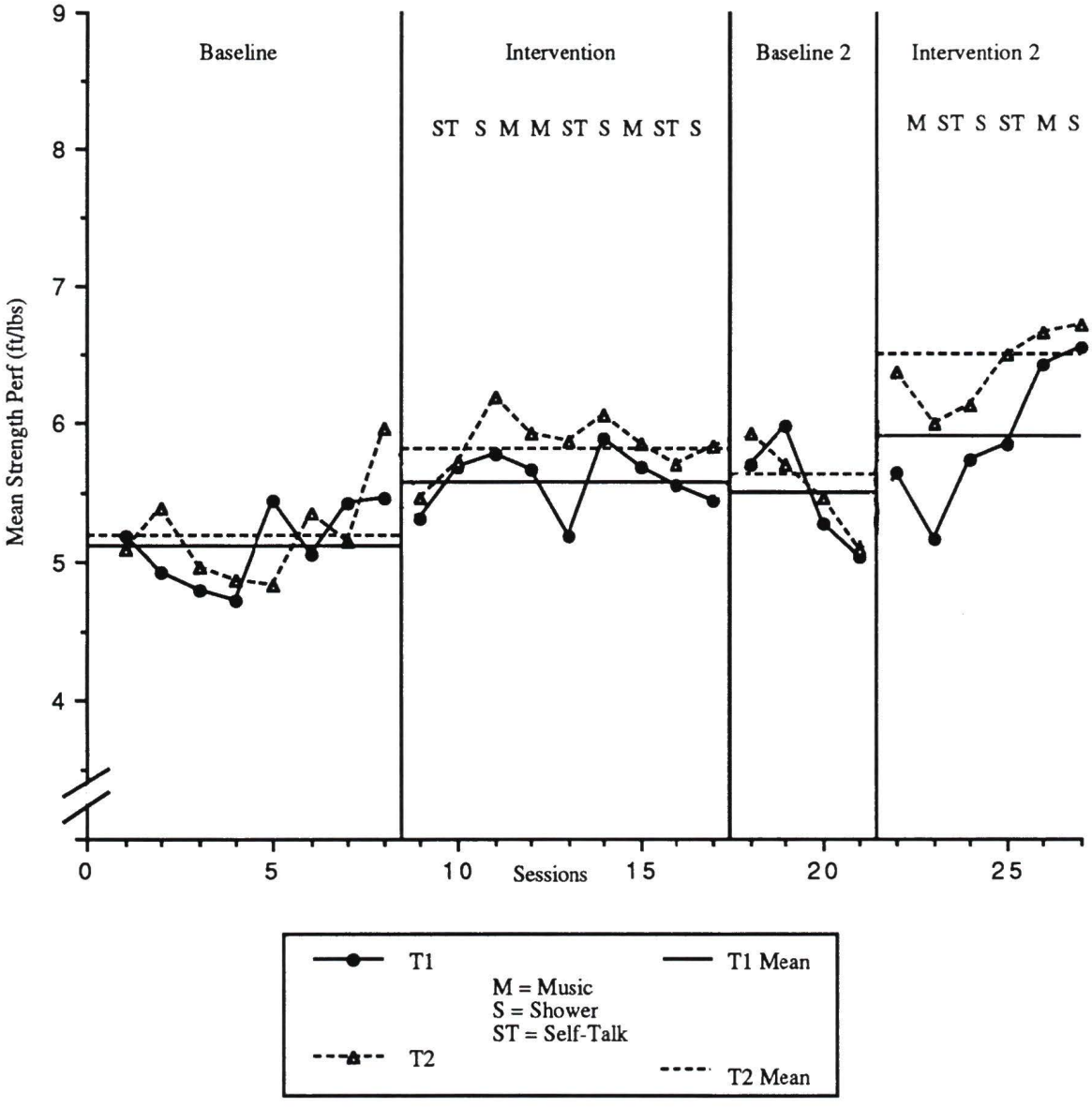


Figure 2

Mean Strength Perf (ft/lbs) for Subject 1 Across Experimental Conditions.

trend was reversed to an increasing trend with the reintroduction of energizing in the final phase while the magnitude of mean strength performance was once again increased. There appeared to be no latency in the rate of change with visible trends occurring with the onset of each new phase. The drop in magnitude and decreasing trend with the withdrawal of energizing was not an anticipated result during a period of continual strength training. Hence, energizing may play an important long term motivating role which would be beneficial for athletes engaged in training programs.

Patterns in strength performance from Trial 1 to Trial 2 were examined across phases. The two baseline phases showed no consistent pattern in strength performance from Trial 1 to Trial 2, but during the two intervention phases there was a consistent pattern which showed a higher strength performance for Trial 2 than for Trial 1. The only difference between Trial 1 and Trial 2 when compared with the baseline phase was that energizing was introduced prior to Trial 2 in the intervention phase. The observed difference implies the higher strength performances in Trial 2 of the intervention phase were a result of energizing. The differences in strength performance became more pronounced over time during the first intervention, but showed a declining trend in the last intervention phase. This could have been due to a ceiling effect reached where by Subject 1 was performing progressively close to her maximal level. There appeared to be no latency effect with changes occurring immediately with the onset of the different phases.

These patterns are supported by the changes in magnitude of the mean performance shifts from Trial 1 to Trial 2 across the experimental phases. The baseline phase had an average increase of 0.07 ft/lbs for Trial 2 over Trial 1, this increased to 0.27 ft/lbs in the intervention phase, was reduced to 0.1 ft/lbs in the second baseline phase and then increased to 0.5 ft/lbs in the final intervention phase (See Table 1).

Table 1

Mean Strength Performance (SP), Perception of Strength , Accuracy of Perception and Heart Rate (HR) for Subject 1 over Trial 1 to Trial 2.

	Baseline	Intervn	Baseline 2	Intervn2
Mean SP (ft/lbs)				
T1	5.13	5.58	5.50	5.94
T2	5.20	5.85	5.60	6.44
Change in SP (ft/lbs), T1-T2.	0.07	0.27	0.1	0.5
% Sessions T2 was perceived strongest.	50%	55%	100%	57.1%
% Sessions strongest Trial was perceived correct.	62%	55%	75%	57.1%
% Sessions HR incr (T1-T2).	37.5%	22%	25%	28.6%

The proportion of sessions for each phase where Trial 2 had higher or lower strength performance than Trial 1 (> 0.15ft/lbs), and where there was no difference between Trial 1 and 2 (0-0.15 ft/lbs) are presented in Figure 3. Higher strength performances were observed in Trial 2 over Trial 1 across all phases. However, this trend became more pronounced in the two intervention sessions, where Trial 2 was shown to have a higher strength performance than Trial 1 in over 90% of the sessions. This is consistent with the changes in magnitude of the mean performance shifts of Trial 2 compared to Trial 1.

In summary, it can be concluded that energizing did improve forearm strength performance for Subject 1. Overall patterns in strength performance across phases showed increases in the magnitude of mean strength performance with energizing. Further, the withdrawal of energizing lead to systematic decreases in strength performance over time, compared to systematic increases with the reintroduction of energizing. There were consistent patterns in strength performance from Trial 1 to Trial 2 across phases. Energizing was able to consistently produce higher strength performances for Trial 2 over the baseline strength measure of Trial 1. There was an increase in magnitude in the mean performance shifts for Trial 2 compared to Trial 1 during the intervention phases. This was consistent with the increase in proportion of cases where Trial 2 was stronger compared to Trial 1 during intervention.

Post Hoc Analyses

1. Will the effectiveness of energizing be related to each individuals' perceived preferences in pre-performance preparation?

An analysis was carried out to examine whether the effectiveness of energizing would be related to an individual's perceived preferences in pre-performance preparation. In the post study interview Subject 1 reported that she believed the energizing techniques helped her to produce higher strength performance but to a differing degree depending on which

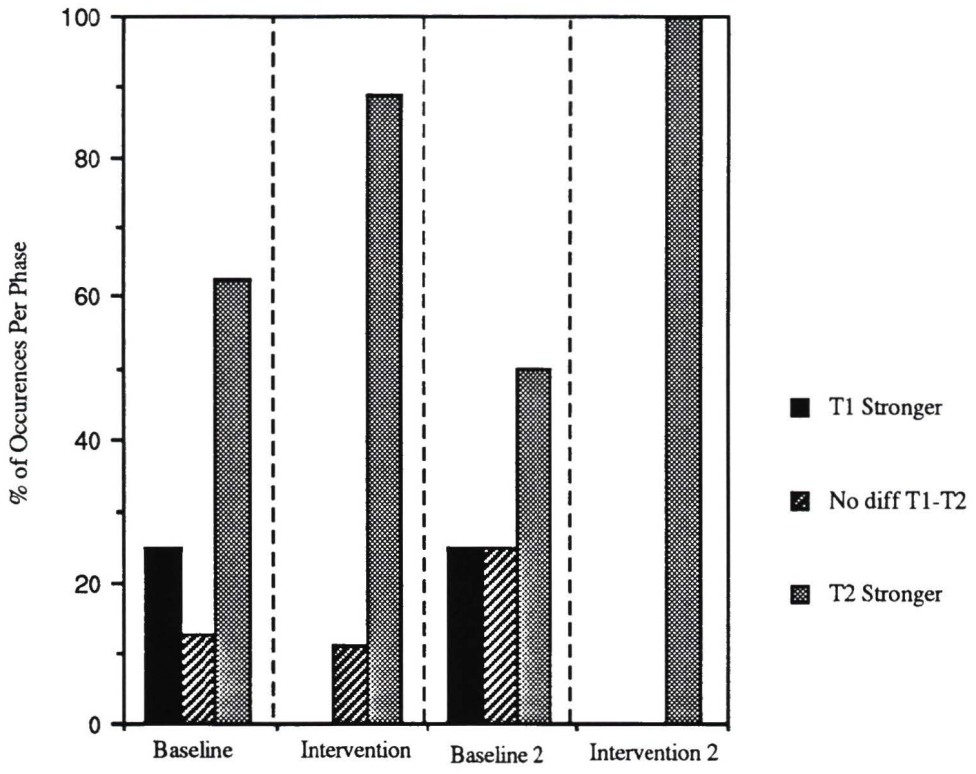


Figure 3

Strength of Trial 2 in Relation to Trial 1 for Subject 1.

technique was used. She felt that the most effective technique would be a combination of music and self-talk and found the shower least effective. These preferences are reflected in her ratings of the effectiveness of each of the techniques to produce a feeling of being more energized (1= not at all; 11=extremely effective), 10 for music, 9 for self-talk, and 8 for shower, all techniques had relatively high ratings.

While there is insufficient data to determine conclusively the efficacy of each energizing technique, it is possible to speculate about the pattern of the difference in strength performance from Trial 1 to Trial 2 as a function of energizing technique. The type of energizing technique is recorded at the top of the graph in Figure 2. There appeared to be no consistent pattern emerging in strength performance as a function of energizing technique. Hence, Subject 1's preferences were not reflected in mean strength performance, with no consistent pattern in strength performance across the three different energizing techniques. However, it should be noted that the ratings of perceived effectiveness to energize were all high and so perhaps little difference would be expected between techniques.

In summary, Subject 1 had preferred music and self-talk over the shower but these preferences did not appear to be reflected in the strength performance. Although, it should be noted that all the techniques had similarly high ratings of effectiveness to energize.

2. Will energizing produce a perception of increased strength?

An examination was also carried out to see if energizing produced a perception of increased strength. Subject 1 reported that she generally felt stronger on the second trial, with the first trial acting more as a warm up, and that the energizing techniques did make her feel like she could generate more strength than with no energizing. The subjects were also asked after each session which trial they thought they were strongest on. Subject 1

reported she felt stronger on the second trial 50% of the time in the baseline phase, 55% in the intervention phase, 100% in the second baseline phase and 57.1% of the time in the second intervention phase. These findings do not support her final claim that energizing was making her feel stronger. However, the accuracy of these predictions ranged from 55% to 75% (See Table 1).

In summary, the mixed post hoc results suggested that energizing did produce feelings of increased strength, but the subject's response after each sessions did not support this perception. There was also a poor degree in accuracy in the predicted and actual strongest trial suggesting the subject had trouble perceiving what strength she was generating.

3. Will energizing result in cognitive, physiological or emotional change?

The final post hoc analysis looked at whether energizing resulted in cognitive, physiological or emotional change. Heart rate was measured to monitor physiological arousal. In the baseline phase heart rate increased from Trial 1 to Trial 2 in 37.5% of the sessions, during the intervention phase with energizing this was reduced to 22 %. In the second baseline phase heart rate was increased 25% of the time, and in the second intervention phase it increased 28.6% of the time. Therefore heart rate in fact decreased from Trial 1 to Trial 2 following energizing 72-75% of the time.

A second measure of arousal was taken with the Activation Deactivation Check List (ADCL), a self-report measure of activation level. Subjects filled out the ADCL prior to and post intervention for a session of music, shower and self-talk. The results are presented in Figure 4. The three energizing techniques produced perceived increases in general activation and high activation, with the exception of the shower condition where

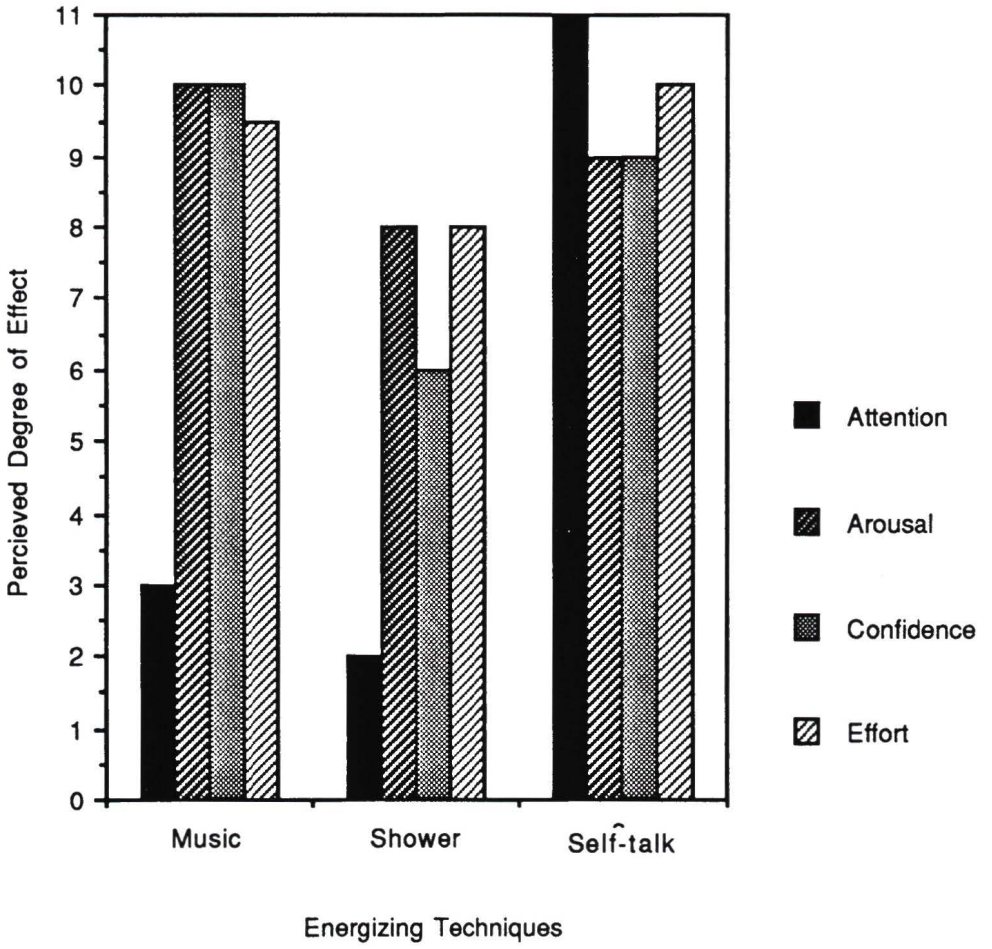


Figure 4

Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-talk for Subject 1.

there was no change in high activation. The deactivation measures of sleep and general deactivation both decreased as a result of the energizing techniques, which supported a general increase in arousal. Hence all techniques had a similar effect on activation-deactivation measures, with increased activation and decreased deactivation. This finding is not consistent with the heart rate data.

Mood state was measured using the Mood Adjective Check List (MACL) which was administered in the same way as the ADCL. The positive emotions of elation, surgency, concentration and vigor, increased as a result of each of the energizing techniques with the exception of elation and surgency with self-talk. The negative emotions of aggression and fatigue both decreased as a result of the energizing techniques, with the exception of aggression with self-talk. Sadness and anxiety were not effected by the energizing techniques (Table 1). Therefore, it appears that energizing does involve an emotional component, all three energizing techniques had a similar effect with the exception of self-talk on elation, surgency and aggression. Positive emotions, most notably vigor and concentration, were increased, whilst negative emotions of fatigue and aggression were reduced by energizing, anxiety and sadness were not effected.

In the post-hoc interview, the subject reported that the feeling of being energized helped her to perform better because she felt more confident, producing a feeling of "no problem", putting her in a better state of mind, and making her feel in a better mood. She also reported it did help her attentional focus, increased her arousal level, confidence, and the feeling of exerting more effort.

However, it was apparent from the self-report data that the three techniques were perceived as having different types of benefits. Subject 1 felt the shower was "refreshing", the self-talk led to "a task focus" and the music produced "a greater feeling of being energized but with a less task oriented focus". These observations are reflected in Figure 5

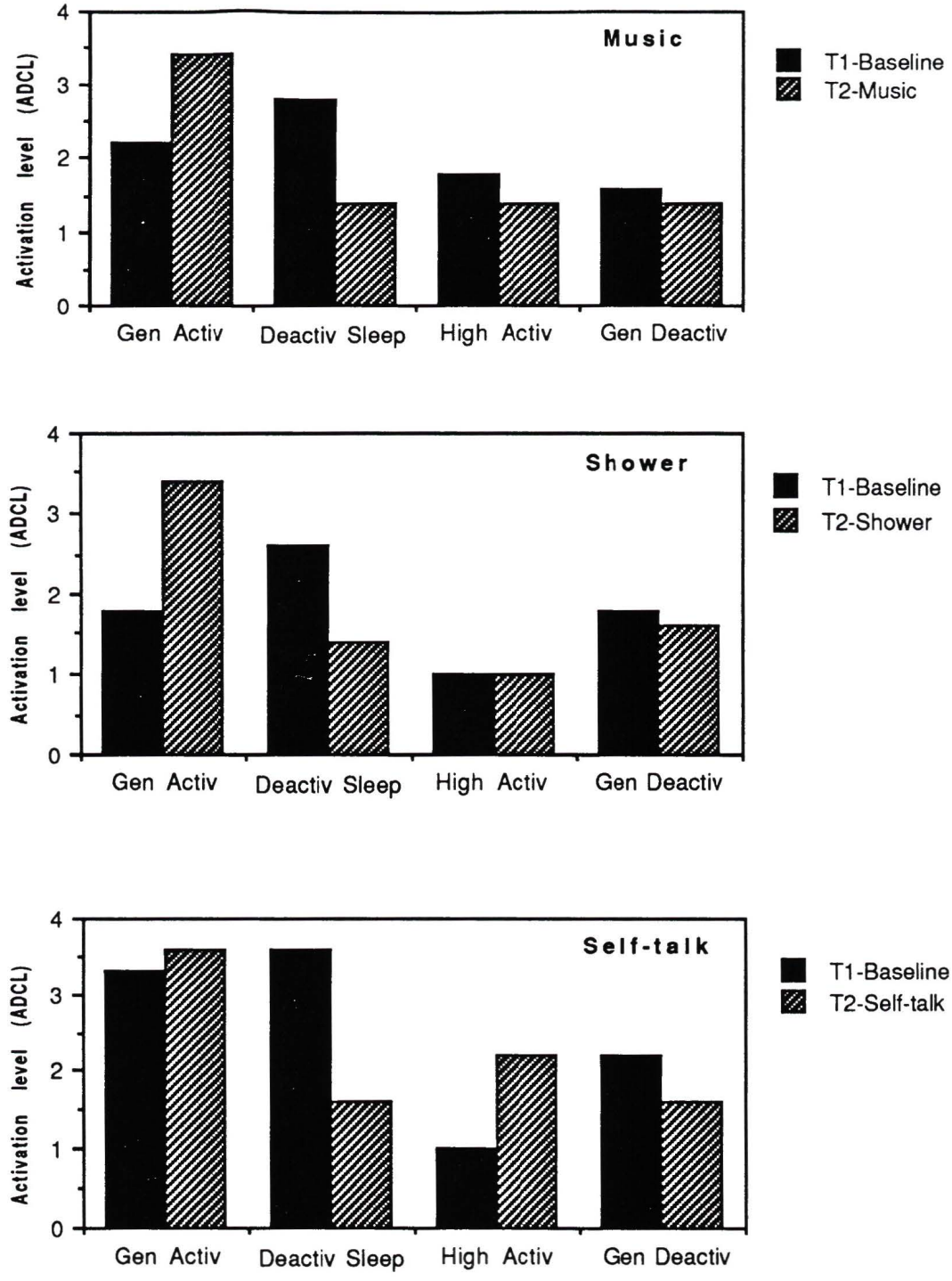


Figure 5
Change in Activation Level from Trial 1 to Trial 2, with Music, Shower and Self-Talk for Subject 1.

where Subject 1 rated each of the techniques on effectiveness to increase arousal, confidence, attentional focus and effort. The subject felt that music was effective in raising arousal, confidence, and effort, but had little effect on attentional focus. The self-talk was effective in all areas while shower was relatively ineffective in attentional focus and moderately effective in the other three areas. Hence from the self-report data it appeared that energizing involved cognitive, emotional and physiological change but this differed depending on the energizing technique being used.

In summary, Subject 1 believed that energizing involved cognitive, emotional and physiological change, but for a differing degree for each of the techniques, music, shower and self-talk. She felt it helped her to perform better through being in a better state of mind and making her feel in a better mood. These findings were supported by the ADCL and the MACL data, where activation level and positive emotions were found to increase, and negative emotions were found to decrease. However, the heart rate data did not support the perceived increases in arousal.

Subject 2

1. Will forearm strength performance be improved through a multi-treatment package of three energizing techniques, listening to music, taking a shower and engaging in self-talk?

In Figure 6 it can be seen there was considerable variability in strength performance across all four phases of the study, with an overall increase in strength performance from Session 1 to Session 27. This increase in strength performance was an anticipated result following eight weeks of strength training. The magnitude of mean strength performance progressively increased for both Trial 1 and Trial 2 with each phase, as would be expected. However, the trend of the strength performance differed across phases. There was a clear increasing trend in the two intervention phases, with a steady increase in strength

Table 2

Changes in MACL Scores for Subject 1, as a Result of Self-talk, Shower and Music.

		Positive Mood states				Negative Mood states			
		Elat	Surg	Conc	Vigor	Agg	Sad	Fatig	Anx
Music	T1	-3	3	1	1	3	-2	3	-3
	T2	2	5	5	5	-2	-2	-3	-3
Shower	T1	-3	4	-2	-1	-1	-2	3	-3
	T2	0	5	-1	5	-2	-2	-3	-3
Self-talk	T1	0	5	-4	2	-3	-2	3	-3
	T2	-3	2	6	5	-2	-2	-3	-2

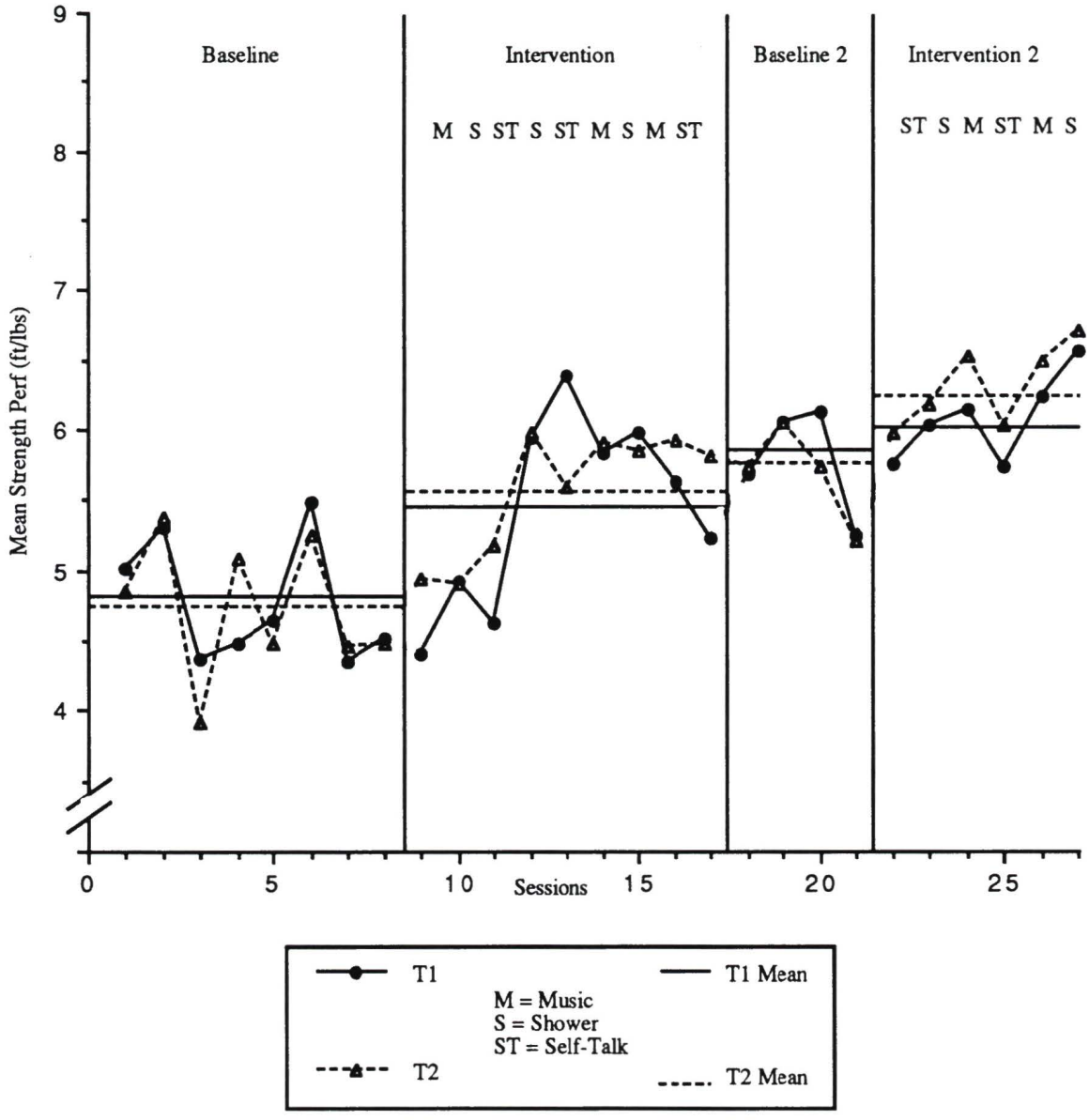


Figure 6

Mean Strength Perf (ft/lbs) for Subject 2 Across Experimental Conditions

performance over time. However, there was no trend in the first baseline phase when perhaps the greatest strength improvements would be anticipated and a decreasing trend in the second baseline phase as energizing was withdrawn, even though the magnitude in mean performance had increased. If the return to baseline phase had been prolonged and the decrease in trend continued, the magnitude of mean strength performance would have fallen. Again this suggests the valuable role of energizing in maintaining motivation over a prolonged period of training. There appeared to be no reliable latency in treatment effect.

The next section of analysis involved the differences in strength performance from Trial 1 to Trial 2. The two baseline phases showed no consistent pattern in strength performance from Trial 1 to Trial 2. In the first intervention phase where subjects were exposed to energizing prior to Trial 2, there was a slight shift in the proportion of cases where Trial 2 was stronger than Trial 1, but this was not consistent. However in the final intervention phase there was a consistent pattern producing a higher strength performance for Trial 2 over Trial 1. This suggests the higher strength performances in Trial 2 were a result of energizing. The differences in strength performance became more pronounced over time across phases, with the energizing showing greatest effect in the last intervention phase. This may imply that increased strength had become a conditioned response to energizing over time (Martin, 1991).

The change in magnitude of mean performance shifts for each trial across experimental phases lends greater support for demonstration of an experimental effect. In the baseline phases with no energizing mean performances in Trial 1 were on average stronger than Trial 2 by 0.03 ft/lbs and 0.09 ft/lbs respectively for Baseline 1 and Baseline 2. In the intervention phases where energizing had been introduced between Trial 1 and Trial 2 this pattern was reversed with the mean strength performance in Trial 1 now being weaker than

Trial 2, 0.1 ft/lbs and 0.24 ft/lbs respectively for intervention 1 and intervention 2 (Table 3).

The proportion of sessions for each phase where Trial 2 had higher or lower strength performance than Trial 1 (> 0.15ft/lbs), and where there was no difference between Trial 1 and 2 (0-0.15 ft/lbs) are presented in Figure 7. The data support the above findings, in the first baseline phase Trial 2 produced stronger performance than Trial 1 just over 10% of the time, in the first intervention phase the number of sessions where Trial 2 was stronger increased, and the number of sessions where Trial 1 was stronger decreased. In the second baseline phase there was no difference between Trial 1 and Trial 2. However in the final intervention phase with the reintroduction of energizing Trial 2 once again produced stronger results than Trial 1 100% of the time. These results are consistent with the changes in magnitude of mean strength performance shifts of Trial 2 compared to Trial 1.

It can therefore be concluded that energizing did improve Subject 2's forearm strength performance. Overall patterns in strength performance showed there were systematic increases over time, compared to no change or systematic decreases in strength performance without energizing. Analysis of differences between Trial 1 and 2 revealed a change in magnitude in the mean performance shifts for Trial 1 compared to Trial 2. The introduction of energizing reversed the relationship of Trial 1 producing on average higher strength performance than Trial 2, with Trial 2 producing stronger performance. The treatment efficacy of energizing became stronger over time.

Post Hoc Analyses

1. Will the effectiveness of energizing be related to each individuals' perceived preferences in pre-performance preparation?

Table 3

Mean Strength Performance (SP), Perception of Strength , Accuracy of Perception and Heart Rate (HR) for Subject 2 over Trial 1 to Trial 2.

	Baseline	Intervn	Baseline 2	Intervn2
Mean SP (ft/lbs)				
T1	4.77	5.44	5.78	6.08
T2	4.74	5.54	5.69	6.32
Change in SP (ft/lbs), T1-T2.	- 0.03	0.1	- 0.09	0.24
% Sessions T2 was perceived strongest.	12.5%	44.4%	0%	16.6%
% Sessions strongest trial was perceived correct.	50%	33.3%	25%	16.6%
% Sessions HR incr (T1-T2).	50%	33.3%	0%	16.6%

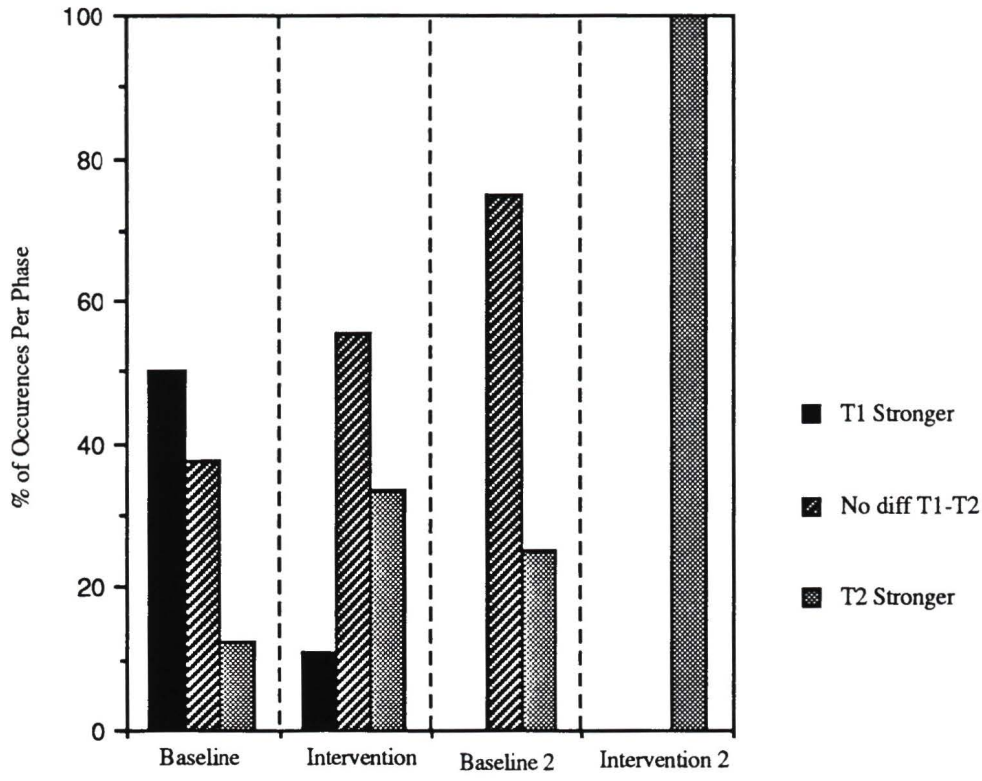


Figure 7

Strength of Trial 2 in Relation to Trial 1 for Subject 2.

The post study interview revealed that Subject 2 believed each of the energizing techniques helped her to produce higher strength performance, but to a differing degree depending on the energizing technique. She rated the shower the most effective technique, then self-talk and then music. These preferences were reflected in her ratings of the effectiveness of each of the techniques to produce a feeling of being more energized (1= not at all; 11=extremely effective), 7 for music, 9 for self-talk, and 9 for shower. These ratings were all relatively high, implying the subject felt all the techniques were effective at producing an energized state.

While there is in sufficient data to determine conclusively the efficacy of each energizing technique, it is possible to speculate about the pattern of the difference in strength performance from Trial 1 to Trial 2 as a function of energizing technique. The type of energizing technique is recorded at the top of the graph in Figure 6, there appears to be no consistent pattern emerging in strength performance as a function of energizing technique. Hence Subject 2's preferences were not reflected in strength performance, with no differing pattern in strength performance across the three different energizing techniques. However, it should be noted that the ratings of perceived effectiveness to energize were all high and so perhaps little difference would be expected between techniques.

In summary Subject 2 believed shower and self-talk over music helped her become energized and generate more strength, but these preferences did not appear to be reflected in the strength performance. Although this could be because the ratings of effectiveness to energize were all relatively high.

2. Will energizing produce a perception of increased strength?

An examination was also carried out to see if energizing produced a perception of increased strength. Subject 2 reported that she generally felt stronger on the first trial, when she felt fresher, but that the energizing techniques did make her feel like she could generate more strength than with no energizing. The subjects were also asked after each session which trial they thought they were strongest on, Subject 2 reported she felt stronger on the second trial 12.5% of the time in the baseline phase, 44.4% in the intervention phase, 0% in the second baseline phase and 16.6% of the time in the second intervention phase. However, these predictions were correct only 16.6-50% of the time (Table 3).

In summary the post hoc results suggested that energizing did produce feelings of increased strength, the subject's perception after each session supported this. However, there was a poor degree in accuracy in the predicted and actual strongest trial suggesting the subject had trouble perceiving what strength she was actually generating.

3. Will energizing result in cognitive, physiological or emotional change?

The final post hoc analysis examined whether energizing resulted in cognitive, physiological or emotional change. Heart rate was measured to monitor physiological arousal. In the baseline phase heart rate increased from Trial 1 to Trial 2 in 50% of the sessions, during the intervention phase with energizing this was reduced to 33.3 %. In the second baseline phase heart rate did not increase in any cases, in the second intervention phase it increased 16.6% of the time. Heart rate in fact decreased from Trial 1 to Trial 2 following energizing 67-84% of the time .

A second measure of arousal was taken with the Activation Deactivation Check List (ADCL), a self-report measure of activation level. Subjects filled out the ADCL prior to and post intervention for a session of music, shower and self-talk. The results are presented in Figure 8. The data show that music and self-talk produced perceived increases

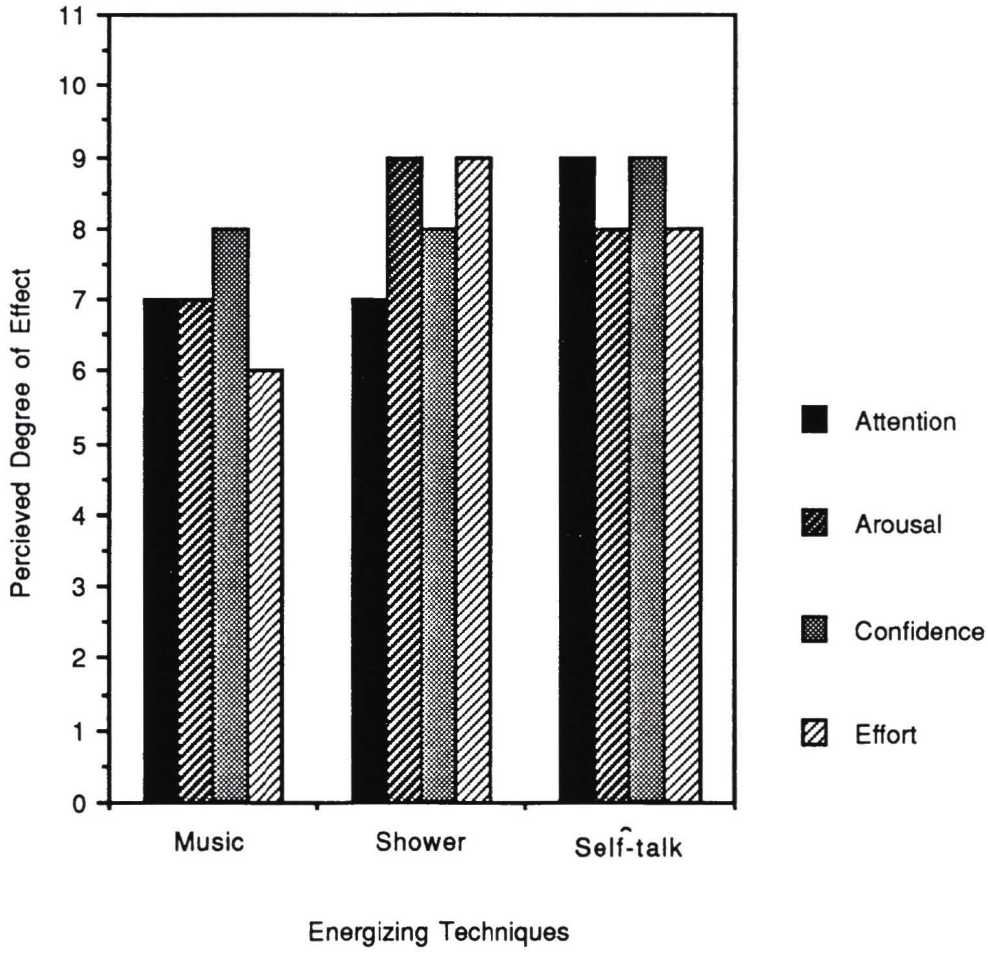


Figure 8

Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-talk for Subject 2.

in general activation and high activation and decreases in the deactivation measures. Taking a shower was reported as having no effect on high activation and producing a decrease in general deactivation, although it should be noted that it was at an above average level at the beginning. General deactivation was also found to increase, although deactivation sleep decreased as a result of the taking a shower. Hence music and self-talk had a similar effect on activation-deactivation measures, with increased activation and decreased deactivation. This finding is not consistent with the heart rate data, in fact the only cases where heart rate was increasing with energizing was with the shower, which had the lowest self-report ratings of activation.

Mood state was measured using the Mood Adjective Check List (MACL) which was administered in the same way as the ADCL. The positive emotions of elation, surgency, concentration and vigor in general increased as a result of energizing, with the exception of concentration with shower and elation with self-talk. The negative emotions were not effected greatly by energizing techniques, although music produced a decrease in sadness and fatigue was decreased by music and self-talk (Table 4). Therefore, music and self-talk had similar effects with the exception of self-talk on elation, surgency and aggression. Positive emotions, most notably vigor and concentration, were increased, while negative emotions of fatigue and aggression were reduced by energizing. Anxiety and sadness were not affected.

In the post-hoc interview the subject reported that the feeling of being energized helped her to perform better through increased concentration and by feeling as though she had more energy to put into the task. She also reported it helped her attentional focus, increased her arousal level, confidence, and at times the feeling of exerting more effort.

However, it was apparent from the self-report data that the energizing techniques of music, shower and self-talk were perceived as having different types of energizing affect.

Table 4

Changes in MACL Scores for Subject 2, as a Result of Self-talk, Shower and Music.

		Positive Mood states				Negative Mood states			
		Elat	Surg	Conc	Vigor	Agg	Sad	Fatig	Anx
Music	T1	-3	-4	-4	-3	-4	2	3	-3
	T2	1	1	2	1	-4	0	-3	-3
Shower	T1	1	5	0	-3	-4	0	-3	-3
	T2	3	6	-2	2	-4	0	-3	-3
Self-talk	T1	-1	0	-3	0	-4	-2	0	-1
	T2	-1	2	3	3	-4	-2	-2	-1

Subject 2 felt the shower was refreshing, the self-talk enabled her to concentrate better and become "pumped" where as the music made her feel good, happy and relaxed. In Figure 9 it can be seen how subject one rated each of the energizing techniques in the degree of attentional focus, effect on arousal, confidence and the ability to exert more effort. All three techniques rated all four variables to some degree, suggesting energizing involved cognitive and physiological components. Shower and self-talk had the highest ratings, but with shower producing greater arousal and effort, while self-talk resulted in better attention and confidence. Hence from the self-report data it appeared that energizing involved cognitive, emotional and physiological change but this differed depending on the energizing technique being used.

In summary, Subject 2 believed that energizing involved cognitive, emotional and physiological change. However, it was for a differing degree for each of the techniques, music, shower and self-talk. These findings were supported by the ADCL. The MACL data showed that positive emotions were found to increase, and negative emotions were found to decrease. However, the heart rate data did not support any increases in arousal.

Subject 3

1. Will forearm strength performance be improved through a multi-treatment package of three energizing techniques, listening to music, taking a shower and engaging in self-talk ?

Overall patterns in strength performance across phases were examined. Visual inspection of Figure 10 shows there was considerable variability in strength performance across all four phases of the study, except during the second baseline phase when performance became stable. There was an overall increase in magnitude of mean strength performance over the first two phases of the study up to Session 14, then a decreasing

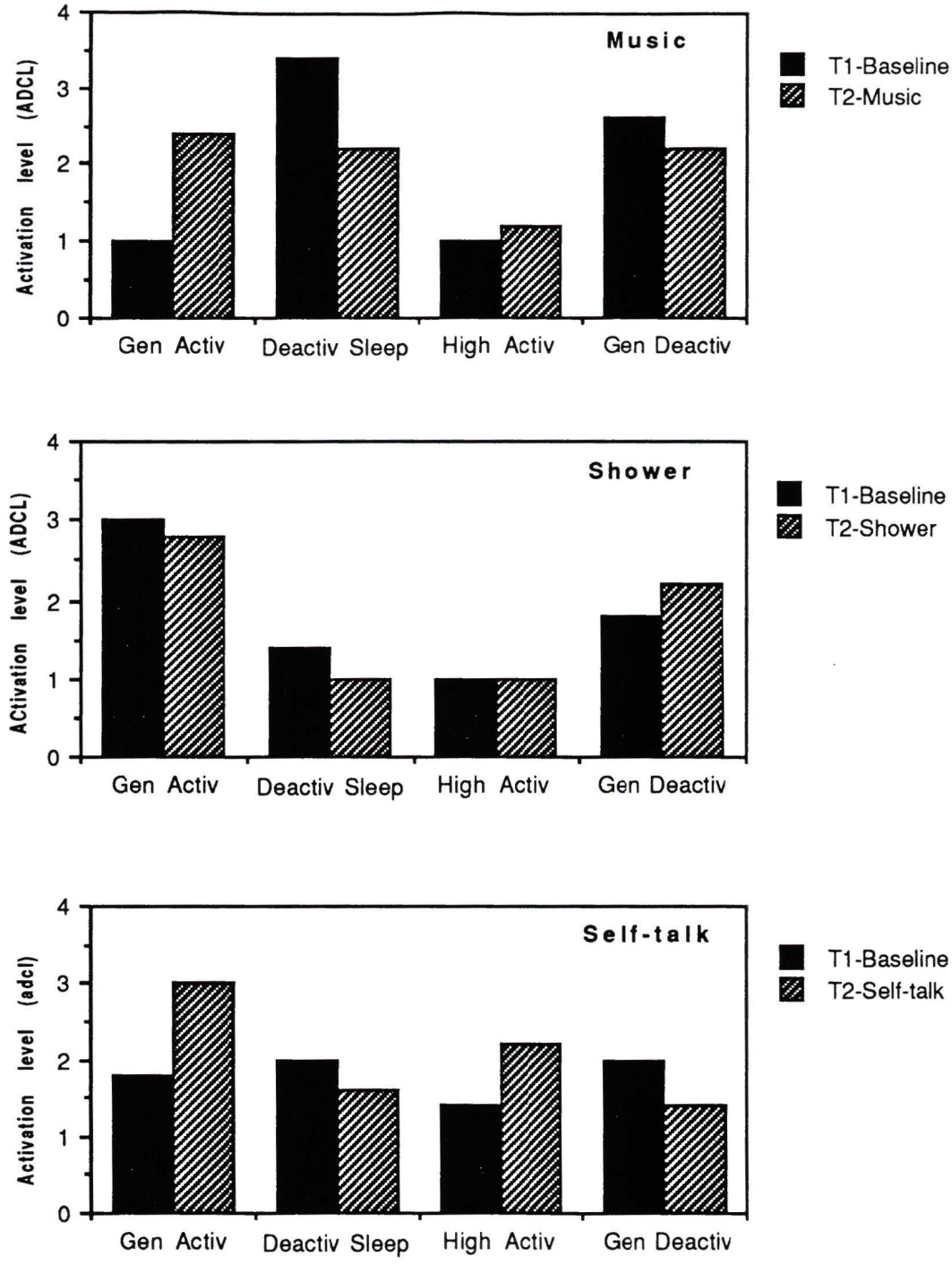


Figure 9
Change in Activation Level from Trial 1 to Trial 2, with Music, Shower and Self-Talk for Subject 2.

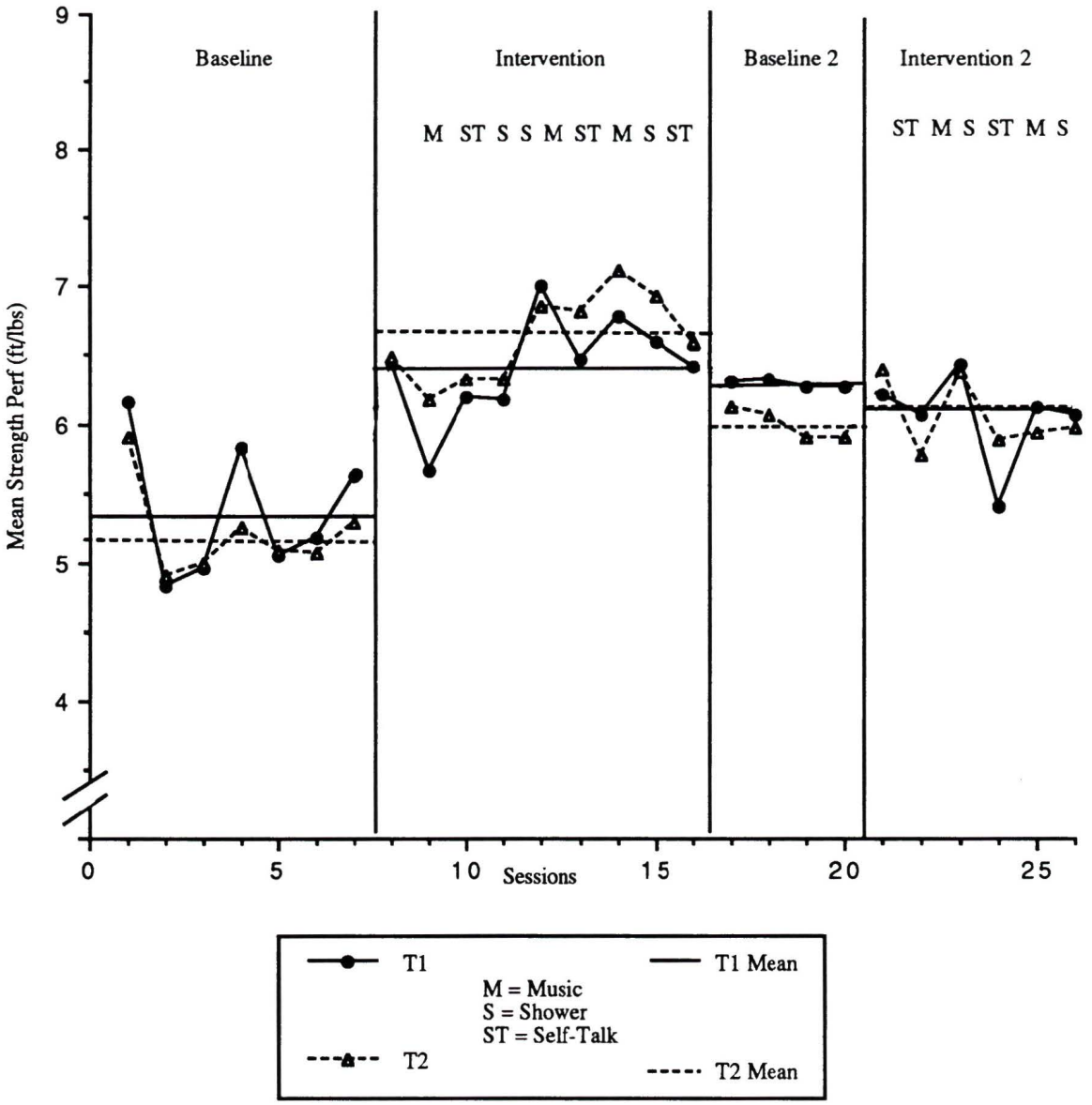


Figure 10

Mean Strength Perf (ft/lbs) for Subject 3 Across Experimental Conditions

trend occurred over the last two phases, although, strength measures remained above initial baseline measures. Strength performance after several weeks of strength training may be expected to level off after initial rapid increases, but would not be expected to show a decreasing trend (Lamb, 1984).

For both Trials 1 and 2 the introduction of energizing in the first intervention phase was accompanied by a large increase in magnitude of mean strength performance over baseline, with an increasing trend up to Session 14. With the withdrawal of energizing in the second baseline phase, there was a decrease in level of mean strength performance and a continuing decreasing trend. The reintroduction of energizing in the final phase, showed no change in magnitude of mean strength performance and continuing decreasing trend, the data showed an increase in variability. Hence, periods of energizing did not appear to lead to consistent increases in magnitude, and could not reverse a decreasing trend.

Differences in strength performance of Trial 2 compared to Trial 1 were examined. The first baseline phase showed a pattern of Trial 1 being stronger or the same as Trial 2, this pattern became more evident in the second baseline phase. During the first intervention phase where subjects were exposed to energizing, this pattern was consistently reversed with higher strength performances for Trial 2 over Trial 1. This was true for all except Session 13, where Trial 1 was marginally stronger than Trial 2. In this session Subject 3 had received external motivation on Trial 1 from a fellow subject who had forgotten that no external motivation was allowed. From the second baseline phase the final phase showed an increase, in the number of sessions where Trial 2 was stronger or the same as Trial 1, but not consistently. Energizing appeared to become less effective as the study progressed, it could be that the novelty of the task was wearing off and motivation was decreased. It also should be noted that in the post study interview Subject 3 reported she generally felt stronger on her first trial which is clearly evident in the second baseline phase. This factor

was a confounding variable in the demonstration of the effect of energizing on strength performance which was limited to the second trial.

These patterns are shown more clearly in Figure 11 which represents the proportion of sessions for each phase where Trial 2 had higher or lower strength performance than Trial 1 (> 0.15ft/lbs), and where there was no difference between Trial 1 and 2 (0-0.15 ft/lbs). The data shows Trial 1 tended to have higher strength performances than Trial 2 in the baseline phases, but in the intervention phases there was a clear shift in the number of sessions where Trial 2 had a higher strength performance than Trial 1.

This pattern in results is supported by changes in magnitude of mean performance shifts from Trial 1 to Trial 2 across the experimental phases (Figure 10). In the baseline phase Trial 1 was on average 0.16 ft/lbs stronger than Trial 2. In the first intervention phase Trial 2 became on average 0.21 ft/lbs stronger than Trial 1. The second baseline phase showed a reversal back to Trial 1 being stronger on average than Trial 2 by 0.29 ft/lbs. In the final phase this large difference was reduced, and Trial 2 became marginally stronger on average than Trial 1 by just 0.01 ft/lbs (Table 5). Hence energizing did appear to be reducing the affect of the preferred performance in Trial 1.

It can be concluded due to the mixed, inconsistent results, that energizing did not successfully demonstrate experimental control. Strength performance showed an overall decreasing trend from session 14, regardless of energizing in the last intervention phase. This decreasing trend was not an expected result after a period of continual strength training (Lamb, 1984). It is only possible to speculate why performance should decrease, whether it was due to lack of effort, or physiological restraints. Subject 3 was a 5th year student under increasing demands as the term progressed, so stress levels could be one possible explanation. Another explanation could have been lack of interest with in the strength training program. Patterns in strength performance from Trial 1 to Trial 2 showed that

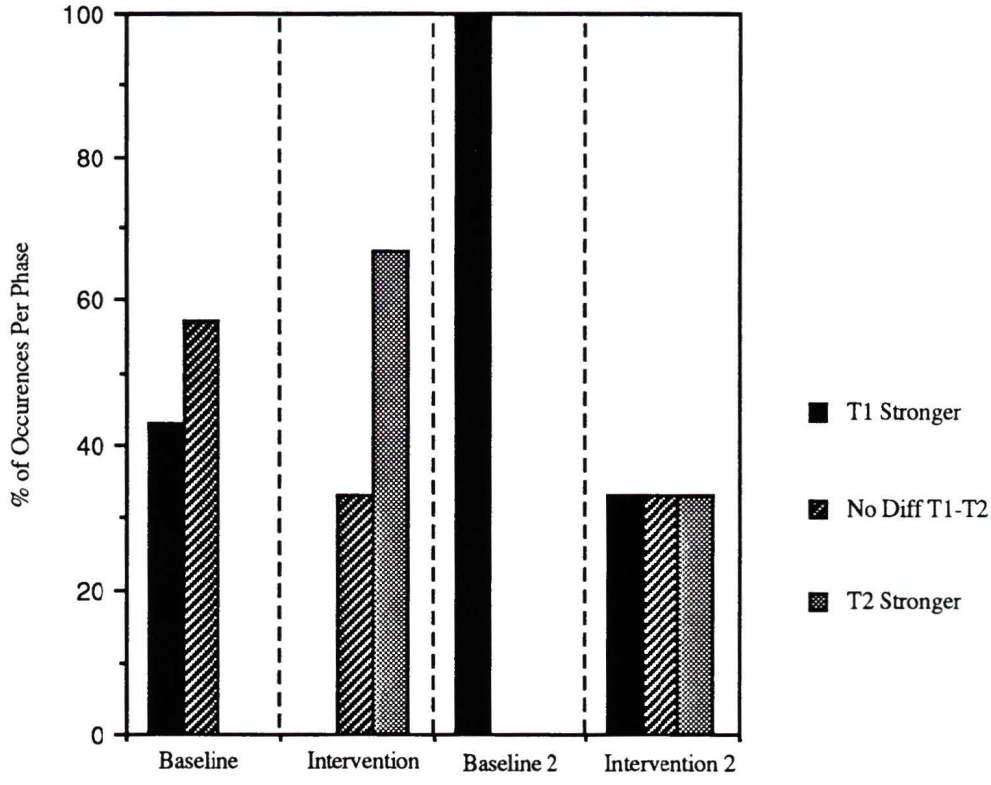


Figure 11

Strength of Trial 2 in Relation to Trial 1 for Subject 3.

Table 5

Mean Strength Performance (SP), Perception of Strength , Accuracy of Perception and Heart Rate (HR) for Subject 3 over Trial 1 to Trial 2.

	Baseline	Intervn	Baseline 2	Intervn2
Mean SP (ft/lbs)				
T1	5.37	6.42	6.29	6.05
T2	5.21	6.63	6.00	6.06
Change in SP (ft/lbs), T1-T2.	-0.16	0.21	-0.29	0.01
% Sessions T2 was perceived strongest.	60%	77%	0%	33%
% Sessions strongest trial was perceived correct.	60%	66%	50%	16.7%
% Sessions HR incr (T1-T2).	85.7%	83.3%	50%	66.7%

in the first intervention phase energizing was able to reverse the baseline pattern of Trial 1 being stronger than Trial 2, and produce consistently higher strength performances for Trial 2 over Trial 1. However, in the second intervention phase energizing appeared less effective, there was a reduction in the number of sessions where Trial 1 was stronger, but no consistent pattern was evident. This suggests other factors were more important than energizing in influencing Subject 3's strength performance.

Post Hoc Analyses

Energizing was not demonstrated to be effective in improving Subject 3's strength performance, hence, only post hoc analyses number two and three were carried out.

2. Will energizing produce a perception of increased strength?

An examination was also carried out to see if energizing produced a perception of increased strength. Subject 3 reported that she generally felt stronger on the first trial, when she was fresher, but that the energizing techniques did make her feel like she could generate more strength than with no preparation. This was reflected in her strength performance results during the two baseline phases. The subjects also were asked after each session on which trial they thought they were strongest. Subject 3 reported she felt stronger on the second trial 60% of the time in the baseline phase, 77% in the intervention phase, 0% in the second baseline phase and 33% of the time in the second intervention phase. This supports her feeling that energizing did produce an increased strength.

In summary the mixed post hoc results suggested that energizing did produce feelings of increased strength. She reported that she generally felt stronger on the first trial, which was reflected in her strength performance results. Her predictions did reflect the general

pattern of results suggesting the subject was able to perceive what strength she was generating.

3. Will energizing result in cognitive, physiological or emotional change?

The third post hoc analysis looked at whether energizing resulted in cognitive, physiological or emotional change. Although, Subject 3 failed to show energizing to be effective, this analysis was carried out to see if any of the cognitive, physiological or emotional measures could help explain why energizing had been ineffective for Subject 3. Heat rate was measured to monitor changes in physiological arousal. Subject 3's heart rate tended to increase from Trial 1 to Trial 2, (see Table 5). In the baseline phase heart rate increased from Trial 1 to Trial 2 in 85.7% of the sessions, during the intervention phase with energizing it remained similar 83.3%. In the second baseline phase heart rate increased only 50% of the time, and then in the second intervention phase it increased 66.7% of the time. In the early phases of the study heart rate may have increased between trials as a result of the physical exertion of Trial 1. As the study progressed Subject 3 would have acquired fitness adoptions, and hence in the second baseline session heart rate was only increasing 50% of the time. The increases in the final phase when fitness would not have fallen could have been a result of the energizing techniques. It is interesting to note that for all except one of the music interventions heart rate increased supporting Subject 3's perception.

A second measure of arousal was taken with the Activation Deactivation Check List (ADCL), a self-report measure of activation level. Subjects filled out the ADCL prior to and post intervention for a session of music, shower and self-talk. The results are presented in Figure 12. The data did not support the heart rate findings. There was a decrease or no change in general and high activation for all three energizing techniques.

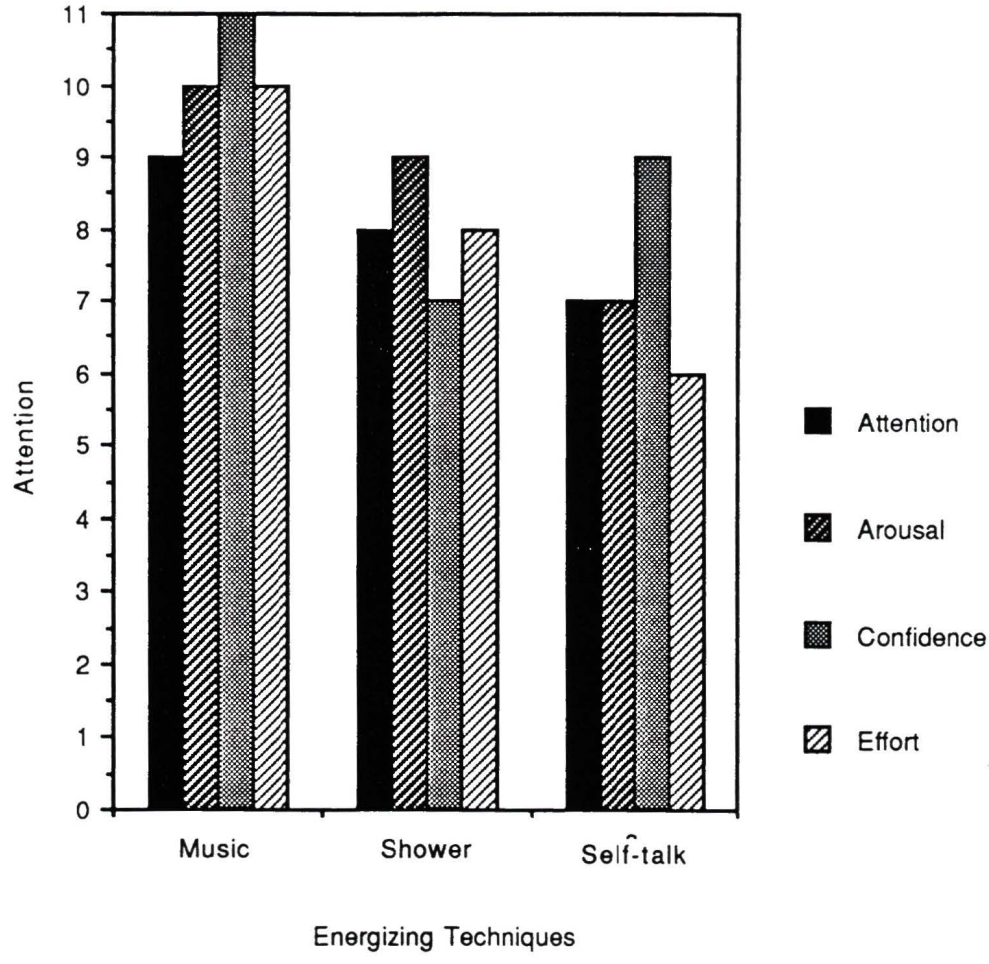


Figure 12

Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-Talk for Subject 3.

The deactivation measures of sleep and general deactivation were decreased as a result of listening to music, but shower and self-talk showed no change or increased in the two measures. Hence music was the only technique that the subject felt produced increases in activation, which supported the heart rate data and her perceptions. The other energizing techniques showed mixed results with no consistent change or a change in the opposite direction.

Mood state was measured using the Mood Adjective Check List (MACL) which was administered in the same way as the ADCL. The results were mixed, the positive emotions of elation and concentration increased except for self-talk and music respectively, vigor remained unchanged except for music where it decreased and surgency decreased except for self-talk. The negative emotions remained unchanged except for an increase in sadness and anxiety with self-talk, and a decrease in fatigue with the shower (Table 6). Hence, the energizing techniques had mixed effects on the MACL measures. Self-talk had no effect or an effect in an undesirable direction on the positive and negative emotions. Music had no effect on the negative emotions and only a desirable effect on elation for the positive emotions. Shower had the most promising impact on Subject 3's emotional state, there was no effect on the negative emotions except for a decrease in fatigue, and had an increase in elation and concentration for the positive emotions.

In the post-hoc interview the subject reported that the feeling of being energized helped her to perform better by making her think about the task while performing and by making her feel less fatigued. She reported it did not help her attentional focus, but increased her arousal level, confidence, and the feeling of exerting more effort.

However, it was apparent that the energizing techniques of music, shower and self-talk had different types of energizing effects. She felt the shower was refreshing making her feel "anew". The self-talk led her to concentrate on the task but sometimes it became

Table 6

Changes in MACL Scores for Subject 4, as a Result of Self-talk, Shower and Music.

		Positive Mood states				Negative Mood states			
		Elat	Surg	Conc	Vigor	Agg	Sad	Fatig	Anx
Music	T1	-3	3	5	3	-4	-2	-1	-3
	T2	1	2	3	2	-4	-2	-1	-3
Shower	T1	-3	2	1	-1	-4	-2	2	-3
	T2	1	0	4	-1	-4	-2	-0	-3
Self-talk	T1	-3	-1	-2	-3	-4	-2	2	-3
	T2	-3	-1	0	-3	-4	0	2	-1

too intense and made her feel drained. The music produced a greater feeling of being hyper increasing her heart rate. In Figure 13 Subject 3's ratings for each of the energizing techniques on the degree of attentional focus, effect on arousal, confidence and the ability to exert more effort are presented. All three techniques affect the ratings of all four variables to some degree, suggesting energizing involves cognitive and physiological components. Music had the highest ratings, then shower, then self-talk. Hence from the self-report data it appeared that energizing involved cognitive and physiological change this differed depending on the energizing technique being used.

In summary, Subject 3 believed that energizing involved cognitive and physiological change, but for a differing degree for each of the techniques, music, shower and self-talk. She found music to be rated the highest in all these components, then shower, then self-talk. These reports were not supported by the ADCL and the MACL data, results were mixed and inconclusive, but if any thing operating in the opposite direction as predicted. The heart rate data supported the feeling of increased arousal, and especially so in the case of listening to music.

Subject 4

1. Will forearm strength performance be improved through a multi-treatment package of three energizing techniques, listening to music, taking a shower and engaging in self-talk?

An inspection of overall patterns in strength performance across phases reveals that there was considerable variability in strength performance across all four phases of the study, with an overall increase in strength performance from Session 1 to Session 27 (See Figure 14). This increase in strength performance was an anticipated result following eight weeks of strength training. For both Trials 1 and 2 the introduction of energizing in the intervention phases was accompanied by an increase in magnitude of mean strength

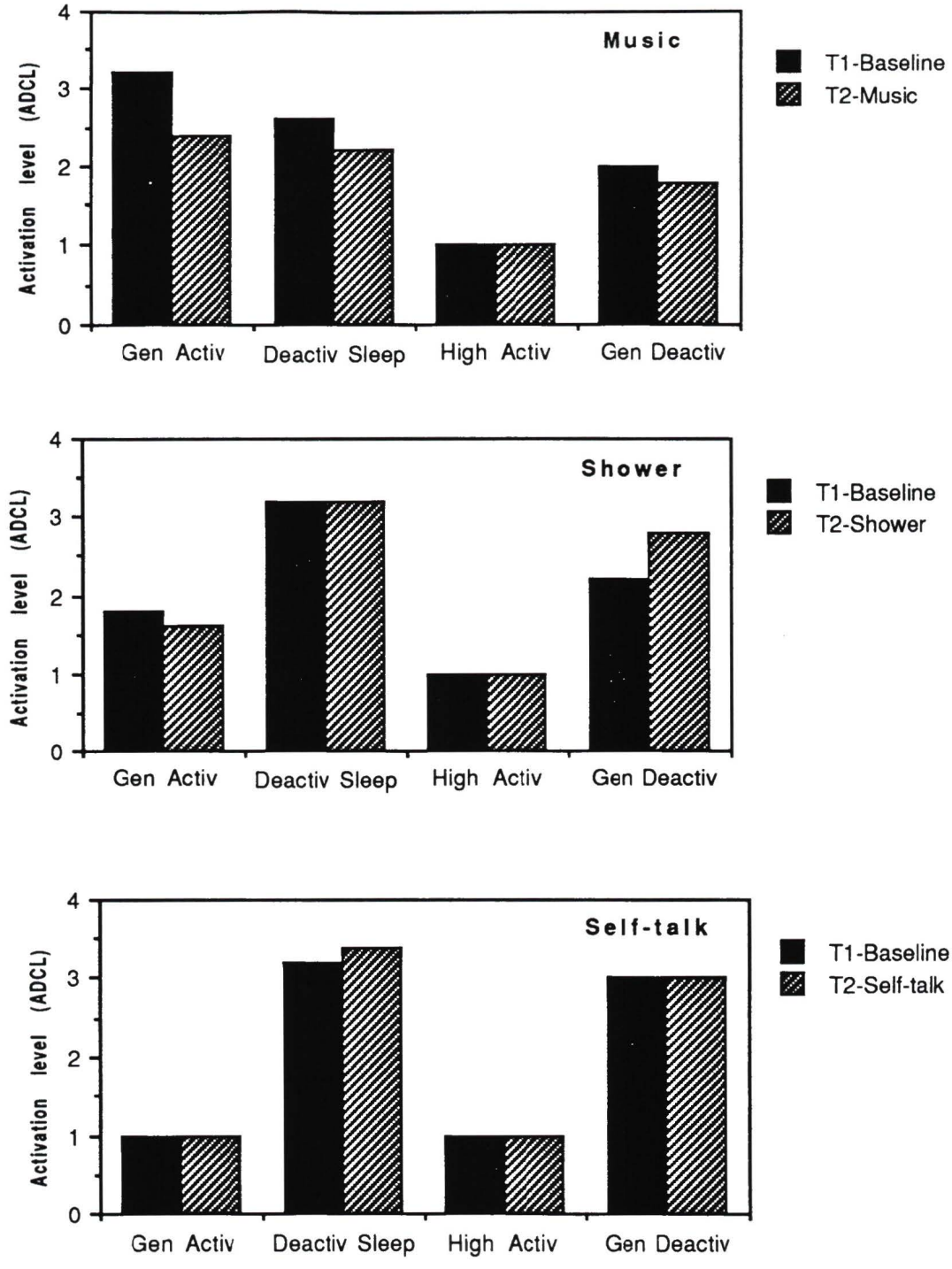


Figure 13

Change in Activation Level from Trial 1 to Trial 2, with Music, Shower and Self-Talk for Subject 3.

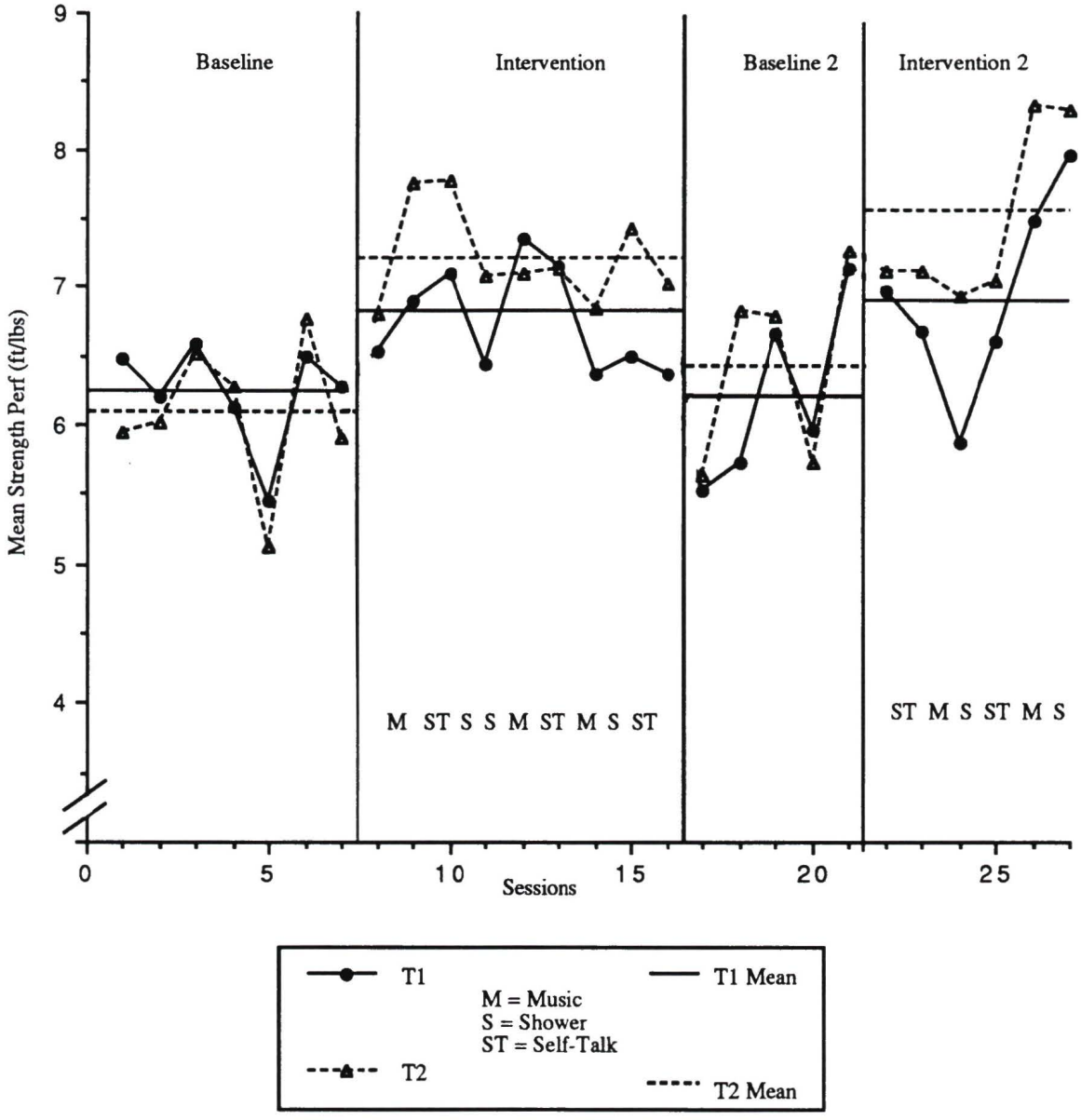


Figure 14

Mean Strength Perf (ft/lbs) for Subject 4 Across Experimental Conditions

performance than for baseline. The final intervention phase showed a clear increasing trend in strength performance, with a steady increase in strength performance over time.

Patterns in strength performance from Trial 1 to Trial 2 were examined across phases. The two baseline phases showed no consistent pattern in strength performance from Trial 1 to Trial 2, but the two intervention phases where subjects were exposed to energizing showed a consistent pattern of higher strength performance for Trial 2 than for Trial 1. In the first intervention phase there were only two sessions where Trial 1's was stronger than Trial 2. In Session 12 the subject had received external motivation on the first trial from a fellow subject who had forgotten this was not allowed. In Session 13 the subject reported that she had not had enough time to prepare herself with the self-talk and had not been ready to perform. The only difference between Trial 1 and Trial 2 from the baseline phases was the introduction of energizing prior to Trial 2. This difference suggests the higher strength performances in Trial 2 of the intervention phases were a result of energizing.

These patterns are reflected in the changes in magnitude of the mean performance shifts of Trial 1 and Trial 2 across each of the experimental phases. In the baseline phase Trial 1 had an average increase of 0.15 ft/lbs over Trial 2, with the introduction ofenergizing in the second phase Trial 2 became 0.44 ft/lbs stronger than Trial 1. With the withdrawal of energizing in the second baseline phase this was reduced to 0.25 ft/lbs, which was then increased to 0.54 ft/lbs in the final intervention phase (Table 7).

The proportion of sessions for each phase where Trial 2 had higher or lower strength performance than Trial 1 (> 0.15ft/lbs), and where there was no difference between Trial 1 and 2 (0-0.15 ft/lbs) are presented in Figure 15. The data shows a clear increase in the number of sessions where Trial 2 had higher strength performances that Trial 1 when energizing was introduced, 88.8-100% compared to 20-28.6% in the baseline phases.

Table 7

Mean Strength Performance (SP), Perception of Strength , Accuracy of Perception and Heart Rate (HR) for Subject 4 over Trial 1 to Trial 2.

	Baseline	Intervn	Baseline 2	Intervn2
Mean SP (ft/lbs)				
T1	6.23	6.74	6.20	6.93
T2	6.08	7.18	6.45	7.47
Change in SP (ft/lbs), T1-T2.	-0.15	0.44	0.25	0.54
% Sessions T2 was perceived strongest.	50%	77.7%	40%	66.7%
% Sessions strongest trial was perceived correct.	50%	77.8%	40%	66.7%
% Sessions HR incr (T1-T2).	33.3%	25%	20%	40%

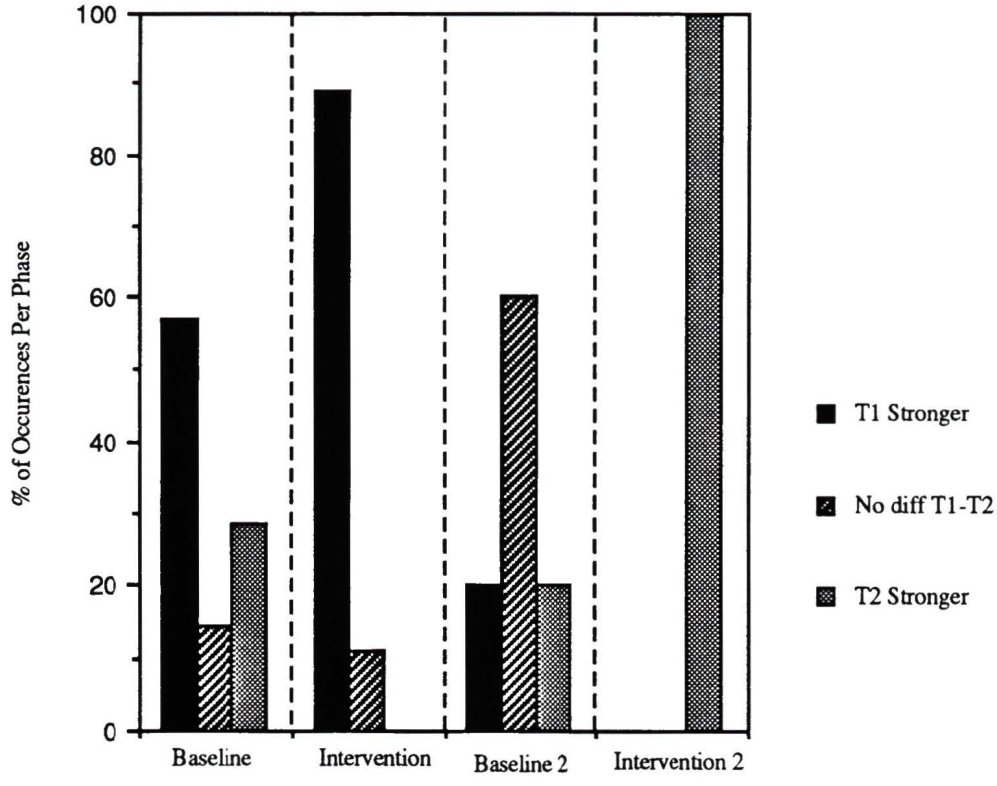


Figure 15

Strength of Trial 2 in Relation to Trial 1 for Subject 4.

It can therefore be concluded that the magnitude of mean strength performance across experimental phases was higher with energizing, with an increasing trend in the last intervention phase. Examination of patterns between Trial 1 and Trial 2 revealed that on any given day energizing was able to consistently produce higher strength performances for Trial 2 compared to Trial 1 which was performed without energizing. During the intervention phases there was an increase in the proportion of cases where Trial 2 was stronger compared to Trial 1, which was reflected in the increased magnitude of mean performance shifts for Trial 2 compared to Trial 1.

Post Hoc Analyses

1. Will the effectiveness of energizing be related to each individuals' perceived preferences in pre-performance preparation?

An analysis was carried out to examine whether the effectiveness of energizing would be related to an individual's perceived preferences in pre-performance preparation. The post study interview revealed that Subject 4 reported that she believed the energizing techniques helped her to produce higher strength performance but each to a differing degree. She rated music as being most effective, then shower and then self-talk. These preferences were reflected in her ratings of the effectiveness of each of the techniques to produce a feeling of being more energized (1= not at all; 11=extremely effective), 10 for music, 10 for shower, and 5 for self-talk.

While there is insufficient data to determine conclusively the efficacy of each energizing technique, it is possible to speculate about the pattern of the difference in strength performance from Trial 1 to Trial 2 as a function of energizing technique. The type of energizing technique is recorded at the top of the graph in Figure 14. Subject 4's preferences do not appear to be reflected in strength performance with no consistent pattern

in strength performance across the three different energizing techniques. Hence subject 4's preferences were not reflected in mean strength performance, with no consistent pattern in strength performance across the three different energizing techniques. However, Subject 4 reported that the techniques did not effect her in a consistent manner across the period of the study, she felt it depended on her health each day, and what she had done the day before or was to do later in the day.

In summary Subject 4 greatly preferred music and shower over self-talk, but the difference in preference was not reflected in strength performance.

2. Will energizing produce a perception of increased strength?

An examination was also carried out to see if energizing produced a perception of increased strength. Subject 4 reported that she generally felt stronger on the second trial with the first trial acting more as a warm up. However, she felt that the energizing techniques did make her feel like she could generate more strength than with no energizing putting her muscles in the appropriate state and making her feel in a better mood. The subjects were also asked after each session which trial they thought they were strongest on, Subject 4 reported she felt stronger on the second trial 50% of the time in the baseline phase, 77.8% in the intervention phase, 40% in the second baseline phase and 66.7% of the time in the second intervention phase. However, the accuracy of these predictions ranged from 40% to 77.8% (Table 7).

In summary the post hoc results suggested that energizing did produce feelings of increased strength, and the subject's response after each sessions supported this perception. There was a varying degree in accuracy in the subject's predicted and actual strongest trial suggesting the subject had trouble perceiving what strength she was actually generating.

3. Will energizing result in cognitive, physiological or emotional change?

The final post hoc analysis looked at whether energizing resulted in cognitive, physiological, or emotional change. Heart rate was measured to monitor physiological arousal. In the baseline phase heart rate increased from Trial 1 to Trial 2 in 33.3% of the sessions, during the intervention phase with energizing this was reduced to 25%. In the second baseline phase heart rate increased 20% of the time, but in the second intervention phase it increased 40% of the time. Hence even though in the final intervention phase there was a slight increase in the number of sessions heart rate was increasing with the addition of energizing, heart rate in fact decreased from Trial 1 to Trial 2 even after energizing 60-80% of the time.

A second measure of arousal was taken with the Activation Deactivation Check List (ADCL) a self-report measure of activation level. Subjects filled out the ADCL prior to and post intervention for a session of music, shower and self-talk. The results are presented in Figure 16. The three energizing techniques generally produced perceived increases in general activation and high activation, with the exception of high activation with music. Whereas the deactivation measures of sleep and general deactivation both decreased as a result of the energizing techniques. Hence all techniques had a similar effect on activation-deactivation measures, with a general increase in activation and decrease deactivation. These finding are not consistent with the heart rate data.

Mood state was measured using the Mood Adjective Check List (MACL) and was administered in the same way as the ADCL. There were mixed results among the different energizing techniques, (see Table 8). Self-talk had little no effect on any of the emotions, except an increase in fatigue and concentration and a decrease in aggression. Music had no effect on the negative emotions, increased vigor and elation, but decreased surgency and

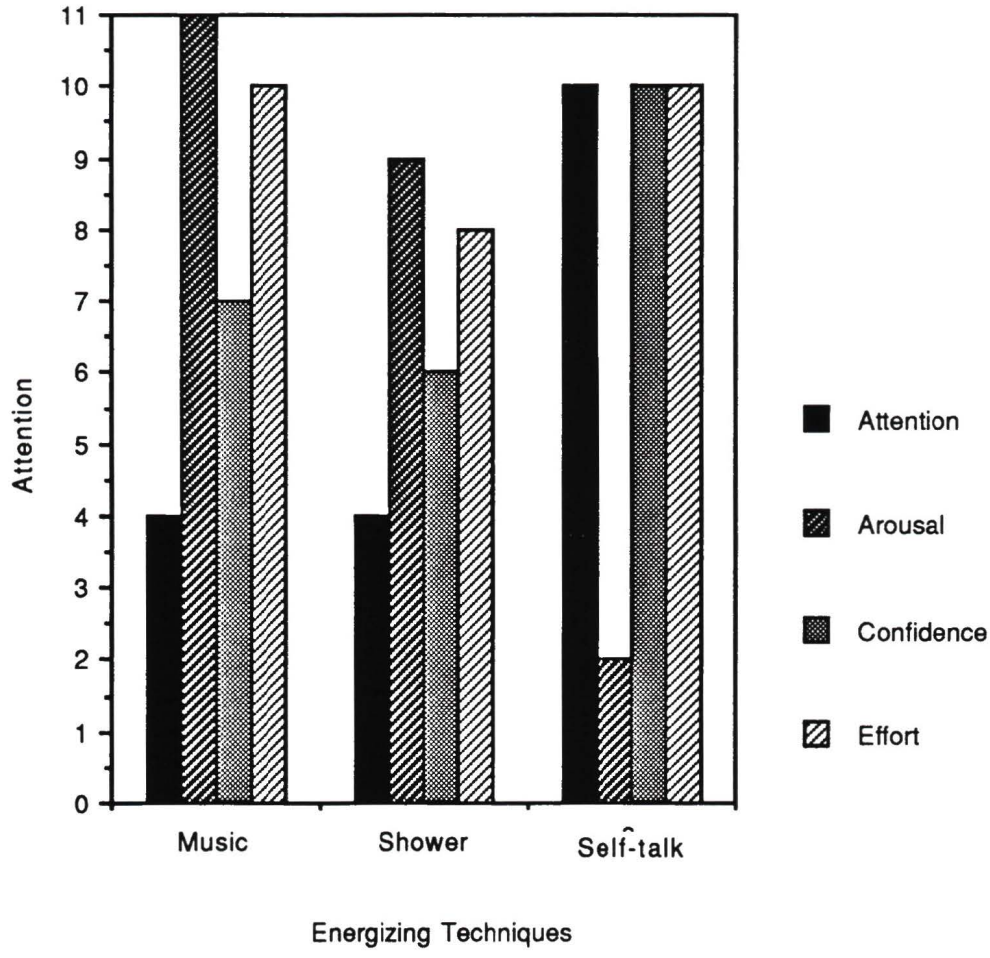


Figure 16

Perceived Degree of Attentional Focus, Arousal, Confidence, and Exertion of Effort as a Result of Music, Shower and Self-Talk for Subject 4.

Table 8

Changes in MACL Scores for Subject 4, as a Result of Self-talk, Shower and Music.

		Positive Mood states				Negative Mood states			
		Elat	Surg	Conc	Vigor	Agg	Sad	Fatig	Anx
Music	T1	1	3	2	0	-4	-2	-3	-3
	T2	3	0	1	3	-4	-2	-3	-3
Shower	T1	0	-1	-1	3	-4	-2	-2	-3
	T2	3	2	-3	3	-4	-2	-3	-3
Self-talk	T1	-3	-4	-1	-3	-1	-2	4	-3
	T2	-3	-4	4	-3	-2	-2	1	-3

concentration. Shower had no effect on the negative emotions with the exception of a decrease in fatigue, but increased elation and surgency, whilst decreasing concentration. Therefore, it appears that results were mixed with all three energizing techniques having differing effects, emotions were reported as being effected less compared to the other subjects.

In the post-hoc interview the subject reported that the feeling of being energized helped her to perform better by helping her to "generally feel better", her "muscles felt in an appropriate state" and she felt in "a better mood". She also reported it did help her attentional focus, increase her arousal level, the feeling of exerting more effort, and sometimes making her feel more confident.

However, it was apparent from the self-report data that the energizing techniques of music, shower and self-talk had different types of energizing effects. She felt the shower woke her up, the music made her feel better and self-talk although reminded her "you can do it" felt it dragged her down energy wise. How Subject 4 rated each of the energizing techniques in the degree of attentional focus, effect on arousal, confidence and the ability to exert more effort, is presented in Figure 17. All three techniques were rated on all four variables to some degree, although, music and shower were low in attentional focus and self-talk was low in arousal, suggesting energizing involves cognitive and physiological components. Self-talk despite being her least popular technique was rated highest on attention, confidence and effort, this suggests that the energizing technique does not need to be liked in order to be effective. Hence from the self-report data it appeared that energizing involved cognitive, emotional and physiological change but this differed depending on the energizing technique being used.

In summary, Subject 4 believed that energizing involved cognitive, emotional and physiological change, but for a differing degree for each of the techniques, music, shower

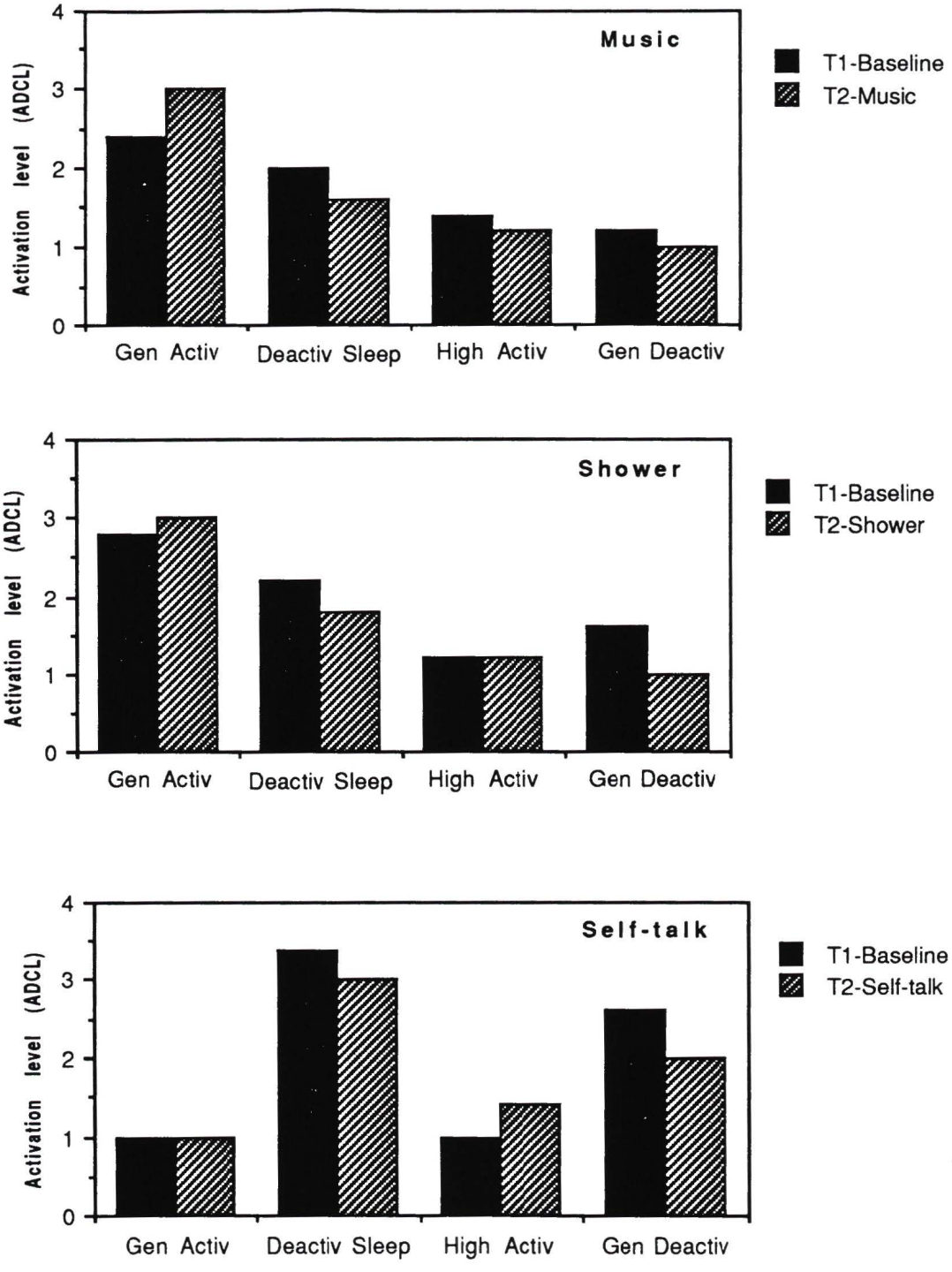


Figure 17

Change in Activation Level from Trial 1 to Trial 2, with Music, Shower and Self-Talk for Subject 4.

and self-talk. Self-talk had the highest ratings in each of the components except for arousal, even though she preferred this technique least. The ADCL measures generally supported the feeling of increased arousal, although this was not consistent with the heart rate data. The MACL data showed mixed results but generally little impact on the emotional state of Subject 4.

Subject 5

Subject 5 completed four weeks of the study and was then forced to drop out due to external demands. It was interesting to note that her strength performance was following a decreasing trend as her reported stress levels were increased (See Appendix J). This suggests that stress could be an important aspect to the attainment of maximal physical performance.

Subject 6

Subject 6 completed three testing sessions and was forced to drop out due to the strength task aggravating a shoulder injury.

Subject 7

1. Will forearm strength performance be improved through a multi-treatment package of three energizing techniques, listening to music, taking a shower and engaging in self-talk?

Overall patterns in strength performance across phases were examined, not looking at differences between trial's one and two. Visual inspection of Figure 18 shows that after a stable baseline strength performance became variable from day to day over the last three phases of the study, with an overall decrease in strength performance from Session 1 to Session 24. For both Trials one and two the magnitude of mean strength performance held

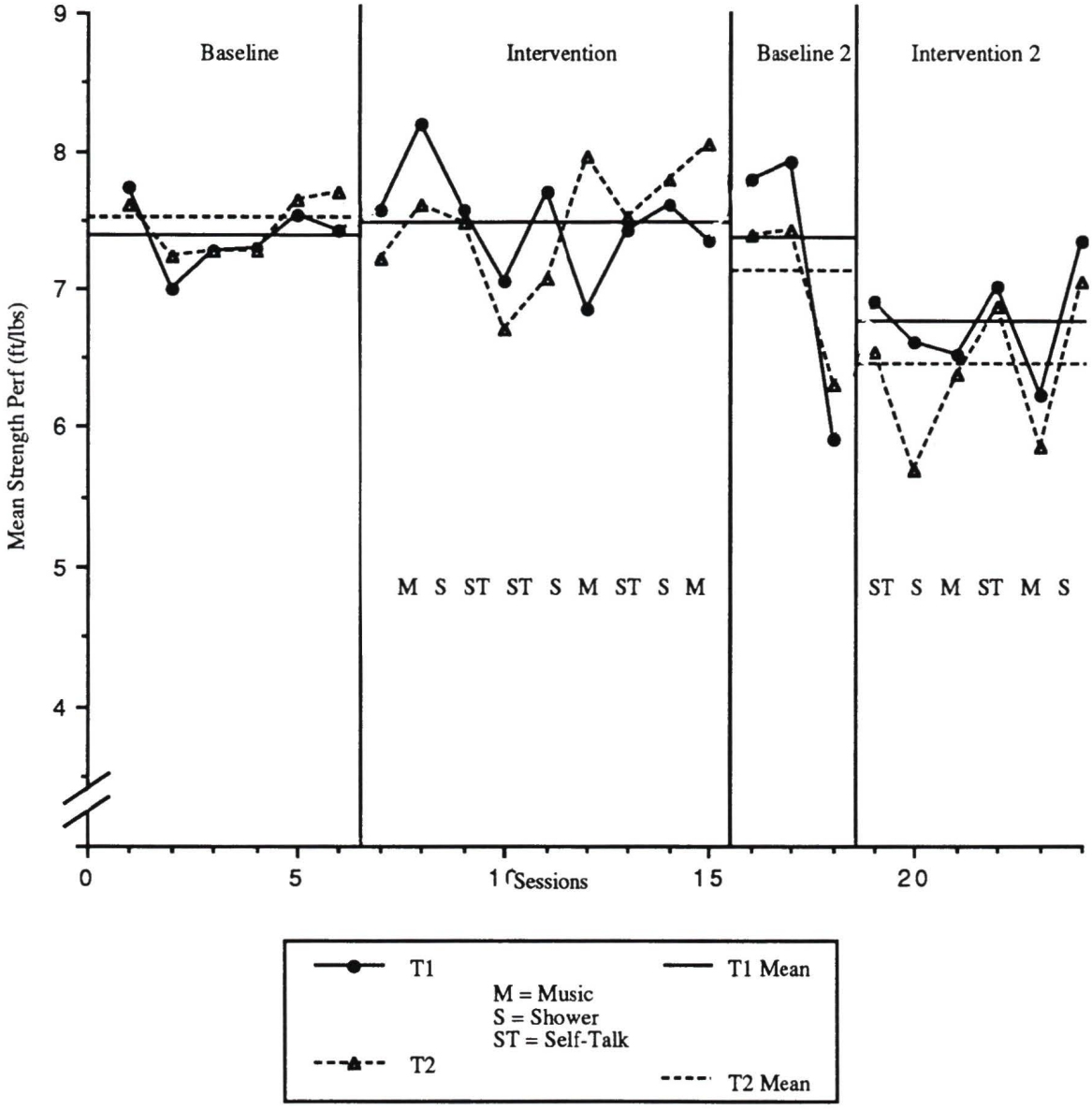


Figure 18

Mean Strength Perf (ft/lbs) for Subject 7 Across Experimental Conditions

constant for the first two phases of the study and then decreased in the final two phases of the study. Strength performance followed a decreasing trend with the withdrawal of energizing in phase three, and then became constant at the lower level in the final phase even with the reintroduction of energizing.

This decrease in strength performance was not the expected trend after eight weeks of strength training. The cause of the decrease can only be speculated but one plausible explanation could be increased stress levels. Subject 7 was in her final year of study, as was Subject 3 who also showed a decrease in strength performance, with work demands increasing as term progresses. Interesting Subject 5 who also had a decreasing trend in strength performance dropped out because of the stress caused by too many work demands. It is also possible that interest decreased as the study progressed. Subject 7 had the highest initial measures in strength performance, and so had the least to gain from the study. Rate of improvement in strength performance is lower when initial values are high (Lamb, 1984). Hence, as the study progressed strength improvements were small and would have provided little incentive to keep applying maximal efforts.

Patterns in strength performance from Trial 1 to Trial 2 were examined across phases. The two baseline phases showed no consistent pattern in strength performance from Trial 1 to Trial 2, this was also true for the first intervention phase where Subject 7 had been exposed to energizing. The final intervention phase showed a consistent pattern producing a higher strength performance for Trial 1 over Trial 2, which suggests energizing had not been effective and in fact had been detrimental to performance. These observations are reflected in the changes in magnitude of the mean performance shifts from Trial 1 to Trial 2 across the experimental phases (Figure 18). The baseline phase had an average increase of 0.12 ft/lbs for Trial 2 over Trial 1. There was was no difference in the mean performance shifts for Trial 1 and Trial 2 in the first intervention phase. Trial 1 became stronger than

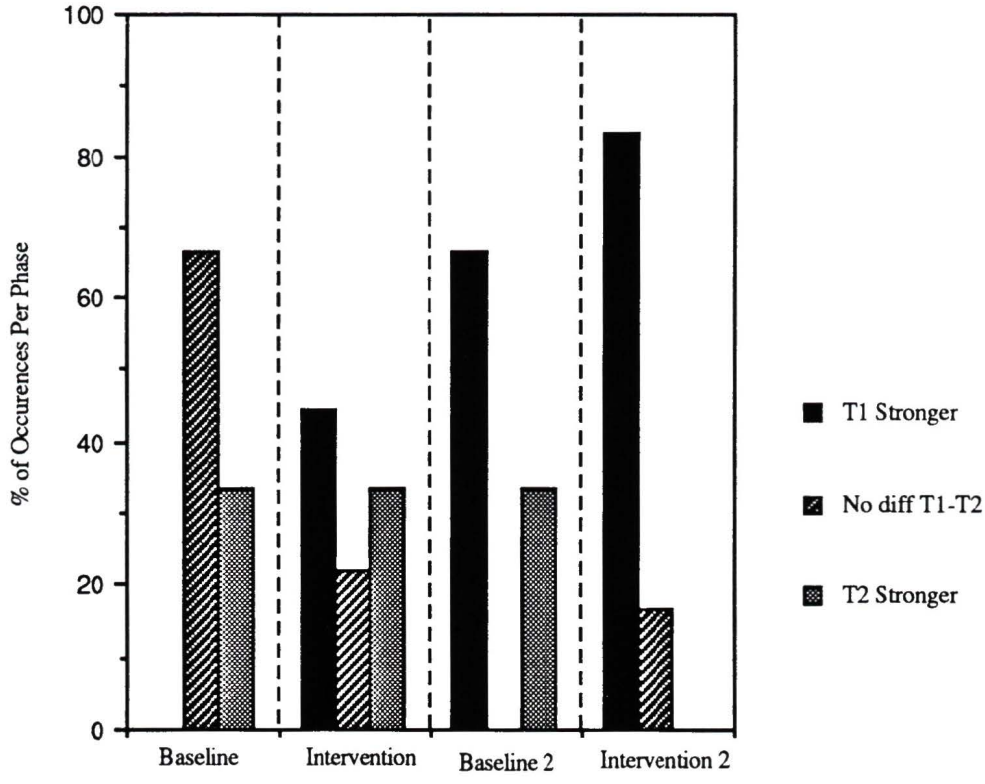


Figure 19

Strength of Trial 2 in relation to Trial 1 for Subject 7.

Table 9

Mean Strength Performance (SP), Perception of Strength , Accuracy of Perception and Heart Rate (HR) for Subject 7 over Trial 1 to Trial 2.

	Baseline	Intervn	Baseline 2	Intervn2
Mean SP (ft/lbs)				
T1	7.38	7.48	7.21	6.78
T2	7.50	7.48	7.03	6.41
Change in SP (ft/lbs), T1-T2.	0.12	0.00	-0.18	-0.37
% Sessions T2 was perceived strongest.	16.6%	11.1%	33.3%	33.3%
% Sessions strongest trial was perceived correct.	33.3%	33.3%	66.7%	33.3%
% Sessions HR incr (T1-T2).	16.7%	25%	33.3%	66.6%

Trial 2 by 0.18 ft/lbs during the second baseline phase. Then increased to 0.37 ft/lbs in the final intervention phase (Table 9).

The proportion of sessions for each phase where Trial 2 had higher or lower strength performance than Trial 1 (> 0.15ft/lbs), and where there was no difference between Trial 1 and 2 (0-0.15 ft/lbs) are presented in Figure 19. The graph displays a consistent increase in the number of sessions across phases where Trial 1 was stronger than Trial 2 regardless of energizing.

It can therefore be concluded that energizing was not effective for Subject 7. Mean strength performance did not increase with energizing across phases and was unable to produce consistent higher strength performances for Trial 2 over Trial 1. In fact energizing produced consistently poorer performances for Trial 2 over Trial 1 in the final phase of the study. The reason for this can only be speculated, it is possible energizing became a distractor or that Subject 7 simply performed better in Trial 1 when she was fresher even though physiologically there was sufficient recovery to enable equal performance on Trial 2.

Post Hoc Analyses

Energizing was not demonstrated to be effective in improving Subject 7's strength performance, hence, only post hoc analysis number two and three were carried out.

2. Will energizing produce a perception of increased strength?

An examination was also carried out to see if energizing produced a perception of increased strength. Subject 7 reported that at the beginning of the week she generally felt stronger on the second trial when she had got used to the movement, but later in the week she felt stronger on the 1st trial because she felt she was getting tired as the trials progressed. She did feel that the energizing techniques made her feel like she could

generate more strength than with no energizing. The subjects were also asked after each session which trial they thought they were strongest on. Subject 7 reported she felt stronger on the second trial 16.6% of the time in the baseline phase, 11.1% in the intervention phase, 33.3% in the second baseline phase and 33.3% of the time in the second intervention phase. However, the accuracy of these predictions ranged from 16.7% to 66.6% (Table 9).

In summary the mixed post hoc results suggested that energizing did produce feelings of increased strength, but the subject's response after each session did not support this perception. There was also a poor degree in accuracy in the predicted and actual strongest trial suggesting the subject had trouble perceiving what strength she was generating.

3. Will energizing result in cognitive, physiological or emotional change?

The third post hoc analysis looked at whether energizing resulted in cognitive, physiological or emotional change. Although, Subject 7 failed to show energizing to be effective, this analysis was carried out to see if any of the cognitive, physiological or emotional measures could help explain why energizing had been ineffective for Subject 3. Heart rate was measured to monitor physiological arousal. In the baseline phase heart rate increased from Trial 1 to Trial 2 in 16.7% of the sessions, during the intervention phase with energizing it was 25%. In the second baseline phase heart rate increased 33% of the time. Only in the second intervention phase, when energizing was ineffective did it increase up to 66.6% of the time. Hence, heart rate was in fact decreasing from Trial 1 to Trial 2 even after energizing 66-83.5% of the time, only in the final phase was heart rate increasing from Trial 1 to Trial 2, but this was when energizing was ineffective at producing higher strength performance .

A second measure of arousal was taken with the Activation Deactivation Check List (ADCL), a self-report measure of activation level. Subjects filled out the ADCL prior to and post intervention for a session of music, shower and self-talk. The results are presented in Figure 20. The data show that music and self-talk produced perceived increases in general activation, but none of the energizing techniques had an effect on high activation. The deactivation measures of sleep and general deactivation decreased as a result of music and self-talk, but increased with the shower. Hence music and self-talk had a similar effect on activation-deactivation measures, with increased activation and decreased deactivation, where as shower showed the reverse effect. The results for music and self-talk are not consistent with the heart rate data, but the shower supports the heart rate results.

Mood state was measured using the Mood Adjective Check List (MACL) which was administered in the same way as the ADCL. The results were mixed with each of the energizing technique having different results. Self-talk increased the positive emotions except elation which was unchanged, the negative emotions were unchanged except fatigue which was decreased and aggression which increased. Music increased the positive emotions, and had no effect on the negative emotions except fatigue which was decreased. Shower increased elation and concentration, and decreased surgency and vigor, the negative emotions were unchanged (Table 10). Therefore, it appears the negative emotions were relatively uneffected except for a decrease in fatigue, and the positive emotions showed mixed results, supporting the claim that the subject found the energizing techniques to have differing effects.

In the post-hoc interview the subject reported that the feeling of being energized helped her to perform better through "enjoying and concentrating more on the task". She reported

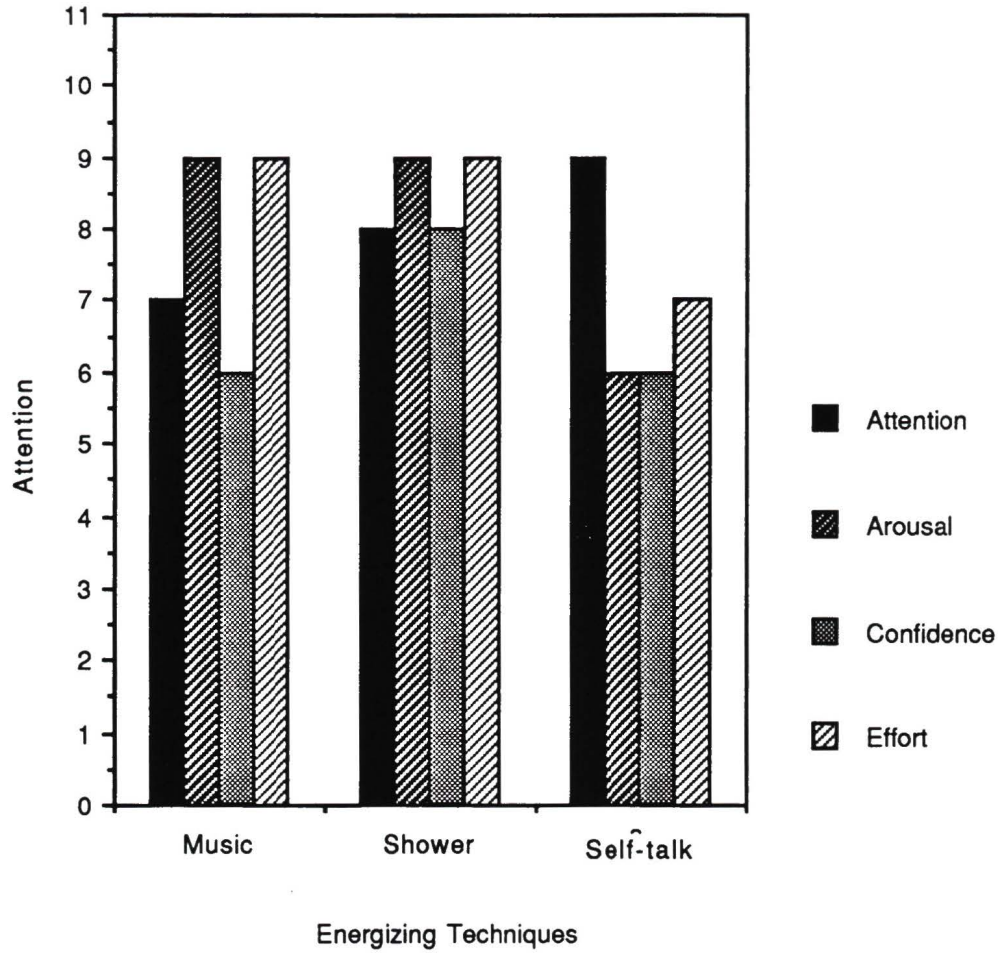


Figure 20

Perceived Degree of Attentional Focus, Arousal, Confidence and Exertion of Effort as a Result of Music, Shower and Self-Talk for Subject 7

Table 10

Changes in MACL Scores for Subject 7, as a Result of Self-talk, Shower and Music.

		Positive Mood states				Negative Mood states			
		Elat	Surg	Conc	Vigor	Agg	Sad	Fatig	Anx
Music	T1	-2	1	3	3	-4	-2	-4	-3
	T2	0	0	5	5	-4	-2	-3	-3
Shower	T1	1	5	1	5	-4	-2	-3	-3
	T2	2	2	3	4	-4	-2	-3	-3
Self-talk	T1	-3	-4	-1	-3	-4	-2	5	-3
	T2	-3	-2	4	1	-2	-2	-3	-3

it did help her attentional focus, increase her arousal level,and the feeling of exerting more effort, but not through increasing her confidence.

However, it was apparent from the self-report data that the energizing techniques of music and shower had similar types of energizing effects. Subject 7 felt they generally refreshed her, stimulated her senses and increased her level of intensity. Although, she did energizing techniques in the degree of attentional focus, effect on arousal, confidence and the ability to exert more effort are presented in Figure 21. All three techniques rate all four variables to some degree, suggesting energizing involves cognitive and physiological components. Self-talk had lower ratings for arousal, confidence and effort, but the highest rating in attention, suggesting attention alone was not important for Subject 7 to feel energized. Hence from the self-report data it appeared that energizing involved cognitive and physiological change but this differed depending on the energizing technique being used.

In summary, Subject 7 believed that energizing involved cognitive, emotional and physiological change, but for a differing degree for each of the techniques, music, shower and self-talk. These findings were supported by the ADCL and the MACL data, where mixed results were found. The ADCL and heart rate data were not consistent in supporting the claim of an increase in arousal with energizing.

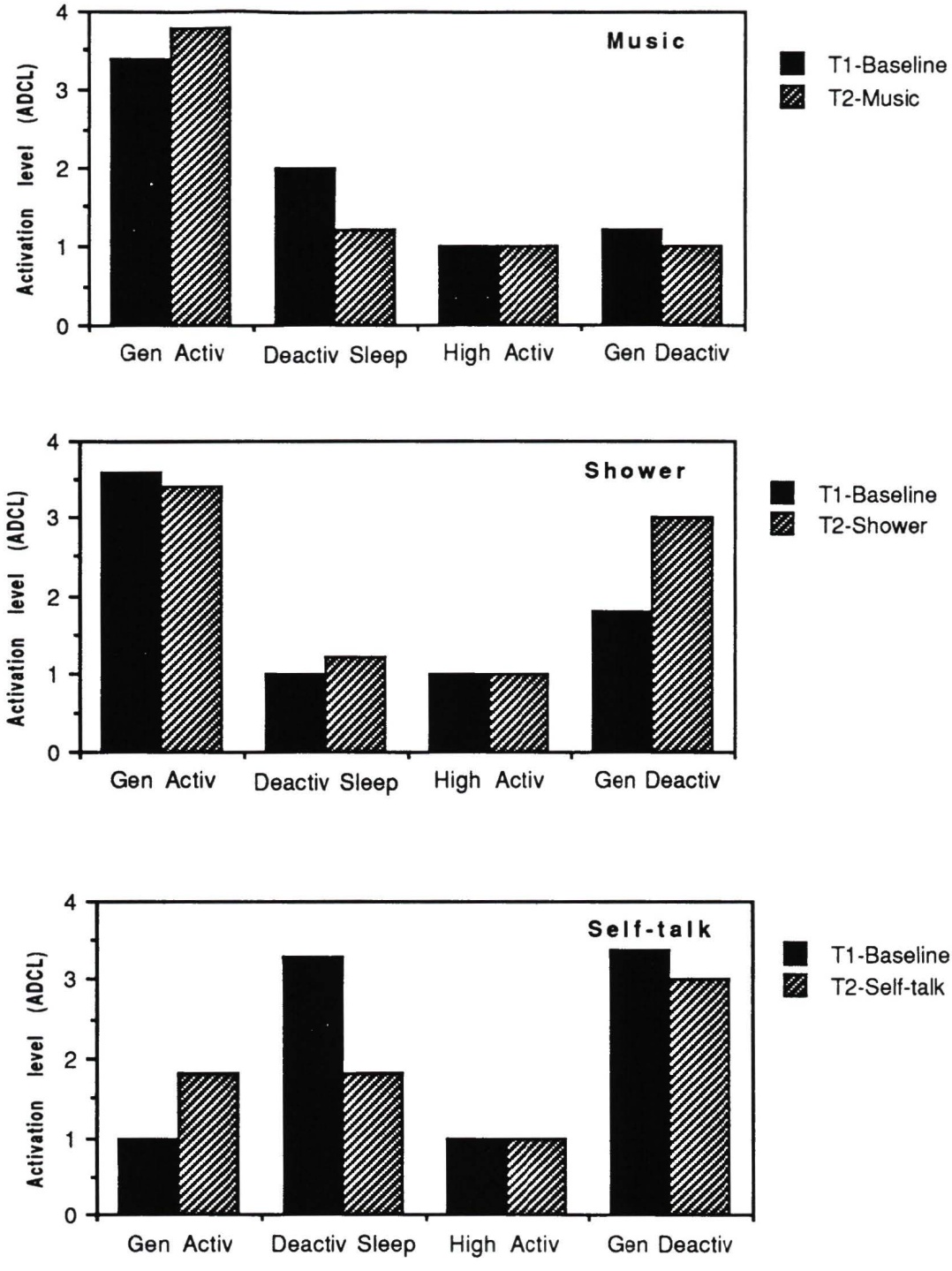


Figure 21

Change in Activation Level from Trial 1 to Trial 2, with Music, Shower and Self-Talk for Subject 7.

Subject Overview and General Discussion

From the results and discussion it can be concluded that forearm strength performance was improved with the energizing techniques for three out of the five subjects who completed the study. This supports claims made in the literature that energizing can enhance performance (Albinson & Bull, 1988; Botterill, 1988; Gauron, 1984; Harris, 1986; Loehr, 1983). Demonstration of the experimental effect was supported in Subjects 1, 2 and 4 through analysis of change in magnitude of means across phases, and the rate of these changes through inspection of trends and latency of the changes. The analyses were carried out in two parts, the first involved the overall pattern in strength performance across phases with the differences between Trial's 1 and 2 not considered. This analysis involved the overall effects of energizing on a period of strength training. The second analysis involved patterns in strength performance from Trial 1 to Trial 2 across phases. The immediate performance enhancing effect of energizing on strength over different sessions was assessed.

The change in magnitude of mean strength performance for Trials 1 and 2 was higher during intervention phases for Subjects 1 and 4. There was an increasing trend over time in the intervention phases compared to decreasing or no trend in the baseline and withdrawal phases for subjects 1 and 2. There appeared to be no latency in the changes giving stronger support for an experimental effect (Kazdin, 1982). These results suggest that energizing had a beneficial effect on strength training, with increases in rate of improvement and/or higher levels of strength performance. Energizing may play an important role in enhancing motivation to perform maximally over prolonged periods of strength training. This would support anecdotal evidence reported by Botterill (personal communication, April, 1991).

The analysis of differences between Trial 1 and Trial 2 revealed consistently higher strength performance in Trial 2 compared to Trial 1 during intervention. This was reflected in the magnitude changes of the mean performance shifts, where Trial 2 showed an increased average rate of strength performance in Trial 2 over Trial 1 and in the proportion of cases where Trial 2 became relatively stronger than Trial 1. The effect of energizing became stronger for Subject 2 as the training progressed, perhaps suggesting that she was becoming more efficient at using the energizing techniques to increase strength. It is possible that the response to energizing became a more effective conditioned response over time. Energizing became slightly less effective for Subject 1 towards the end of the study, but this was believed to be because of a ceiling effect from the maximal levels of strength performance she was achieving.

Hence, for Subjects 1, 2, and 4 the multi-treatment package of energizing techniques was found to be an effective method for producing a consistently higher forearm strength performance over an eight to ten week period of strength training. The considerable day to day variability in strength performance was an interesting observation, indicating that the attainment of maximal performance appears to be under the influence of other contingencies. Energizing appeared to be a successful method for reducing the variability with consistent enhancement of strength performance. Subjects also indicated that the training was more enjoyable with energizing. Effectiveness and enjoyment are two valuable factors in producing high quality efficient training, which may be a contributing factor for successful performances in top level athletics.

Subject 3 and 7 failed to demonstrate an experimental effect for energizing on forearm strength performance. Subject 3 had inconsistent results in that she only showed energizing to be effective in the first intervention phase. Her preference in performance on the first trial was a problem in demonstrating the effect of energizing. Subject 7 had

inconsistent results in the first intervention phase and then showed energizing to be clearly ineffective in the final intervention phase with energizing actually being detrimental to performance. Energizing resulted in consistently lower strength performance than the control reading backward condition. A possible explanation for this detrimental effect could have been that energizing acted as a 'distractor'. Subject 7 had been involved in formal strength training previously and may have developed her own pre-performance preparation routines which in her case may have been less disrupted with the control reading backwards condition than with energizing. It is interesting to note that Subject 7 believed that the energizing techniques were effective in helping her to produce higher strength performances.

Another possible factor in evaluation of the effectiveness of the energizing was that both subjects were seen to have a decrease in overall strength performance. This is not the anticipated result after eight to nine weeks of strength training, three times a week (Dudley & Djamil, 1985). Reasons for these results can only be speculated. The novelty of the task and its relative importance may have decreased with time, and hence the subjects motivation to perform maximally. This might have been particularly true for Subject 7 who had high levels of forearm strength prior to the commencement of the study and may have been demotivated by relatively small improvements in strength performance. Although, in the post study interview, neither subject indicated this to be a problem.

Another variable common for Subjects 3 and 7 that differentiate them from the other subjects was the emotional state in response to energizing. Their responses to the MACL indicated they had a mixed and less positive emotional state after energizing. It could be that the effectiveness of different energizing techniques is related to a positive emotional experience which appears to be individualized. Hence, time should be taken to find techniques that work for a particular individual.

Post Hoc Analyses

An analysis was carried out to see if efficacy of the energizing technique was related to each individual's perceived preference in pre-performance technique. There was insufficient data to determine conclusively the efficacy of each energizing techniques with only a maximum of three data points per technique per intervention phase. However, it was possible to begin to speculate about the pattern of difference in strength performance from Trial 1 to Trial 2 as a function of energizing technique.

All subjects believed that the energizing techniques were effective at increasing strength performance but to a different degree depending on which technique was used. It was interesting to note that the subjects' preferences in the techniques to increase strength performance mirrored their ratings of the effectiveness of the techniques to produce an energized state. This suggests the subjects felt the techniques which were most effective at producing an energized state were most effective at increasing strength performance.

All subjects reported differences in their preference ratings for the energizing techniques which they believed were most effective at producing an increase in strength performance. However, no consistent pattern appeared to occur in strength performance as a function of the preferred energizing technique. In fact for Subject 3 in the last intervention phase the only technique to produce an increase in strength performance was the technique she had rated as the least effective. A possible problem in determining which technique was most effective was introduced by Subject 4. She reported the techniques effected her differently over the period of the study with much day to day variability in the perceived effectiveness of the techniques regardless of type.

From this analysis it would appear that the techniques perceived as most effective in producing an energized state were the preferred techniques perceived to be most effective at increasing strength performance. However, type of energizing technique did not appear to

be important in producing improved strength performance despite perceived differences. As noted earlier there was insufficient data points for this to be a definitive conclusion. Further research would be needed before advice based on such a finding was given to athletes.

The analyses higlighted a weak relationship between perceived preference and actual effectiveness of the energizing techniques to produce increased strength performance. There was a poor degree of accuracy in the subjects' abilities to predict their actual strength performances. This is highlighted in Subject 3 who actually performed best in the last intervention phase with her least preferred technique. Nisbett and Wilson (1977) noted problems in using self-reports when subjects could be basing their analysis of a response on an inappropriate stimulus.

A second post hoc analysis was carried out to determine whether energizing was able to produce a perception of increased strength. All subjects reported in the post study interview that energizing did make them feel as though they could generate more strength. This is an important result because if the subject feels as though they can generate more strength, then their confidence to perform has been enhanced which has been shown to lead to increases in performance (Bandura, 1977). Hence, for Subject 3 and 7 even though energizing did not appear effective in producing increased strength performance, it had been successful in enhancing their confidence to perform.

It is interesting to note from this analysis that subjects had trouble perceiving what strength they were actually generating which is consistent with the findings of the first post-hoc analysis. After each session subjects were asked on which trial they thought they had produced the greatest strength. The degree of accuracy in their predictions ranged from 16.5% to 77.8%, suggesting on average subjects only had a 50% chance of predicting accurately which trial had produced the greatest strength. Considering the subjects were

well trained athletes this is a surprising result . Subjects were never told on which trial they were actually strongest, and had no accurate feedback on which to base their predictions. It would have been interesting to know onwhat information the subjects were basing their perceptions. However, it was beyond the scope of the study to pursue this finding further.

The final post-hoc analysis involved whether energizing resulted in cognitive, physiological or emotional change. All subjects reported that each of the energizing techniques involved a degree of cognitive, physiological and emotional change. This supports claims that energizing is a more global process than psych-up techniques (Botterill, 1986; Harris, 1986; Loehr, 1983) when psych-up strategies are defined as operating through cognitive processes alone. Although results of the analysis were individualized for each subject, a general pattern in results appeared to emerge. The measures of the MACL showed an increase in the positive emotional state and a decrease or no change in the negative emotional state. A cognitive change in terms of enhanced attentional focus and increased confidence were reported. The physiological analysis revealed mixed results. The ADCL measures showed a general increase in the activation measures and a decrease in the deactivation measures, supporting the subjects reports of a perceived increase in their arousal level. However, the heart rate data showed in general a decrease from Trial 1 to Trial 2 even with energizing. Subject 3 was the only subject to report a decrease in the ADCL measures and her heart rate in fact increased on average.

The discrepancy between these somatic and cognitive measures of arousal lends support for the views of Caruso et al (1990) who described arousal as a multidimensional variable with the different components operating independently of each other. The analysis also supports the researcher finding somatic and cognitive arousal to have differing relationships with performance (Simmons & Vevera ,1987; Burton, 1988). It also

supports discrepancies between self-report and objective measures of heart rate found by Scott (1988). Again, Nisbett and Wilson's arguments related to self-report are supported.

It is important to note that results were very individualized across subjects, and definitive conclusions from this analysis cannot be made. However, as Rushall (1979) reported it is important to clearly operationalise concepts into their component elements in order to delineate the specific processes underlying motor performance, of which this study made a start. In light of this, it would seem further research at this stage should not rule out any of the components of physiology, cognition or emotion. It may be that energizing results in more than one response. One technique results in responses of a combination of performance enhancing strategies. If this is the case, then use of energizing would support Kendall, et al, 1990 who believed that the use of a combination of mental strategies was effective in enhancing the performance of a defensive basketball skill, and who strongly encouraged further research in this area.

One result which did become apparent through this analysis was that all the subjects perceived the different techniques as clearly having different types of effects. It could be that the different techniques produced different aspects of an energized response with a singular technique not able to produce all reported aspects of an energized state. Glasser 's (1984) control theory of behavior could be used to explain the perceived differences in the techniques as outlined by Botterill (1986). Each technique would be seen as influencing the different components that go to make any total behavior, (physiology, feeling, thinking and doing), producing the desired behaviour, in a more energized state. However, it would seem that caution needs to be taken in describing the energizing techniques of music, shower and self-talk as producing the same 'energized' response. Although the type of technique did not appear important in producing increased strength performance, it is unclear whether the techniques achieved this result through the same means. Further

research should adopt a design which could look at the effects of the different techniques separately.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

In conclusion, it was shown that forearm strength performance was enhanced through energizing for three out of the five subjects who completed the study. Strength performance was seen to be consistently higher with energizing over the eight to ten week period of strength training. These findings lend support to the many claims in the literature that energizing can enhance athletic performance (Albinson & Bull, 1988; Botterill, 1988; Gauron, 1984; Harris, 1986; Loehr, 1983). Further research should be carried out to investigate the effects of energizing on different types of tasks, across different subjects and in competitive situations as well as in training.

The effectiveness of the energizing techniques appeared to be individualistic. Two of the subjects failed to demonstrate energizing to be effective. Both had an overall decrease in strength performance over the period of strength training, and their emotional state was less positive as a result of energizing when compared to the other subjects. It is difficult to speculate how these factors influenced the effectiveness of energizing. Further research needs to be carried out to identify the factors that make the different enerergizing technqiues effective for each individual.

In the post hoc analyses it was found that subjects reported the individual techniques which they felt were most effective at producing an energized state were the most effective for increasing strength performance. However, strength performance did not appear to vary as a function of preferred energizing technique, although, this conclusion needs to be tempered until further research has been carried out to support the findings.

Energizing was found to produce a perception of increased strength. This suggests energizing could play a valuable role in enhancing confidence which has been found

elsewhere to be an important variable in athletic performance (Feltz et al, 1979; Gould & Weiss, 1981; Lee, 1982; Weinberg et al, 1980, 1981).

In general a poor degree of accuracy was found in the subjects' ability to perceive what strength they were generating. It would be interesting to examine onwhat information the athletes were basing their perceptions.

The final post hoc analysis suggested that energizing resulted in cognitive, emotional and physiological change. A general pattern in results appeared to emerge of enhanced attentional focus and confidence, an increase in positive emotional state, and an increase in perceived arousal level, although, this was inconsistent with the heart rate data. Results were individualized across subjects, but at this stage future investigations should not rule out any of three components of cognition, emotion or physiology.

The individual energizing techniques of listening to music, taking a shower and engaging in self-talk, were perceived by the subjects as having different types of effect. Caution was expressed in assuming that different techniques produced the same generalized 'energized' response. It was suggested that the individual techniques should be analyzed separately in future research.

This preliminary investigation on energizing found that specific activities recommended as energizing techniques can be effective in enhancing strength performance. However, the concept of energizing still remains unclear and further research is needed before specific techniques should be categorized as energizing techniques as opposed to mental preparation or psych-up techniques. These initial findings suggest energizing may be distinct from mental preparation or psych-up strategies through being a more global concept than the others which are defined as being purely cognitive. However, it may be that if mental preparation or psych-up strategies were analyzed in a similar multi-dimensional fashion they too would be found to involve emotional and physiological

change as well as cognitive. Hence, it may be only their definition which separates energizing from mental preparation and psych-up strategies. It is recommended that further research in the areas of mental preparation follow the guidelines of Rushall (1979) and attempt to clearly operationalize concepts into their component elements in order to delineate the specific processes underlying motor performance.

REFERENCES

Albinson, J. C. & Bull, S. J. (1988). A mental game plan for all sports. Ontario: Spodym Publishers.

Anshel, M. H., & Marisi, D. Q. (1978). Effect of music and rhythm on physical performance. Research Quarterly, 49(2), 109-113.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological review, 84, 1911-215.

Barger, D. (1979). The effects of music and verbal suggestion on heart rate and self reports. Journal of Music Therapy, 24, 158-171.

Beckett, A. (1990). The effect of music on exercise as determined by physiological recovery heartrates and distance. Journal of Music Therapy, 27, 126-136.

Benson, H. (1980). The relaxation response. In Weinberg, R. S. (1988). The Mental Advantage. Champaign: Leisure Press.

Biddle, S. (1985a). Personal beliefs and mental preparation in strength and muscular endurance tasks: A review. Physical Educator Review, 8(2), 90-103.

Biddle, S. (1985b). Mental preparation, mental practice and strength tasks: A need for clarification. Journal of Sport Sciences, 3, 67-76.

Biller, J. D., Olson, P. J., & Breen, T. (1974). The effect of "happy" versus "sad" music on participation and anxiety. Journal of Music Therapy, 11(2), 73-98.

Botterill, C. (1986). Energizing. Science Periodical on Research and Technology in Sport. Ottawa: Coaching Association of Canada.

Boutcher, S. H., & Trenske, M. (1990). The effects of sensory deprivation and music on percieved exertion and affect during exercise. Journal of Sport and Exercise Psychology, 12, 167-176.

Brown, I., & Innogue, D. K. (1978). Learned helplessnes through modeling: The role of percieved similarity in competence. Journal of Personality and Social Psychology, 36, 900-908.

Bryan, A. (1987). Single-subject designs for evaluation of sport psychology interventions. The Sport Psychologist, 1, 283-292.

Burton, D. (1988). Do anxious swimmers, swim slower? Reexamining the elusive anxiety - performance relationship. Journal of Sport and Exercise Psychology, 10, 113-129.

Caruso, C. M., Dzewaltowski, D. A., Gill, D. A. & McElroy, M. A. (1990). Psychological and physiological changes in competitive state anxiety during noncompetition and competitive success and failure. Journal of Sport and Exercise Psychology, 12, 6-20.

Caudill, D., Weinberg, R. S., & Jackson, A. (1983). Psyching-up an track athletes: A preliminary investigation. Journal of Sport Psychology, 5, 231-235.

Caudill, D. & Weinberg, R. S. (1983). The effects of varying the length of the psych-up interval on motor performance. Journal of Sport Behavior, 6(2), 86-91.

Corah, N. L., Gale, E. N., Pace, L. F., & Eyrek, S. K. (1981). Relaxation and musical programming as means of reducing psychological stress during dental procedures. Journal of American Dental Association, 103, 232-234.

Corbin, C. B. (1972). Mental Practice. In Morgan, W. P. (1972). Ergogenic Aids and Muscular Performance. New York: Academic Press.

Cox, R. H. (1990). Sport Psychology: Concepts and Applications. Dubuque IA: WCB.

Derryberry, D., & Rothbart, M. K. (1988). Arousal, affect and attention as components of temperament. Journal of Personality and Social Psychology, 5(6), 105-122.

Dimberg, U. (1987). Facial reactions of autonomic activity and experience of emotion: A 3 component model of emotional conditioning. Biological Psychology, 24,105-122.

Dishman, R. K. (1980). Overview of Ergogenic Properties of Hypnosis. Journal of Physical and Education and Recreation, 51, 53-54.

Douchamps, F., Heinz, J. & Douchamps, J. (1989). Arousal as a tridimensional variable: An explorative study of behavioral changes in rowers following a marathon race. International Journal of Psychology, 20, 31-41.

Dudley, G. A., & Djamil, R. (1985). Incompatibility of endurance and strength-training moded of exercise. Journal of Applied Physiology, 56, 1446-1451.

Ellis, D. S., & Brighouse, G. (1952). Effects of music on respiration and heartrate. American Journal of Psychology, 65, 39-47.

Feltz, D. L., Landers, D. M., & Raeder, U. (1979). Enhancing self-efficacy in high avoidance motoer tasks: A comparsion of modeling techniques. Journal of Sport Psychology, 1, 112-122.

Feltz, D. L., & Landers, D. M. (1983). The effects of mental practice on motor skill learning and perormance: A meta-analysis. Journal of Sport Psychology, 5, 25-57.

Gaston, E. T. (1951). Dynamic music factors in mood change. Psychological Reports, 37, 42-43.

Gauron, E. (1984). Mental Training for Peak Performance. New York: Sport Science Associates.

Gfeller, K. (1988). Musical components and styles preferred by young adults for aerobic fitness activities. Journal of Music Therapy, 25, 28-43.

Gill, D. L., & Strom, E. H. (1985). The effect of attentional focus on performance of an

endurace task. International Journal of Sport Psychology, 16, 217-223.

Glasser, W. (1984). Control Theory. New York: Harper & Row.

Gould, D., & Weiss, M. (1981). The effects of model simularity and model talk on self-efficacy and muscular endurance. Journal of Sport Psychology, 3, 17-29

Gould, D., Petlichkoff, L., Simons, J., & Vevera, M. (1987). Relationship between competitive state anxiety inventory -2 subscales scores and pistol shooting performance. Journal of Sport Psychology, 6, 289-304.

Gould, D., Weinberg, R., & Jackson, A. (1980). Mental preparation strategies, conditions, and strength performance. Journal of Sport Psychology, 2, 239-339.

Hardy, C. J., & Rejeski, W. J. (1989). Not what, but how one feels: The measurement of Affect during exercise. Journal of Sport and Exercise Psychology, 11, 304-317.

Harris, D. V. (1986). Relaxation and energizing techniques for regulation of arousal. In Williams, J. (Ed) Applied Sport Psychology. Palto Alto, California: Mayfield Publishing.

Hohler, V. (1989) Sport and Music. Sport Science Review, 41-44.

Hull, C. L. (1951). Essentials of Behavior. New Haven, CT: Yale University Press.

Kahneman, D. (1973). Attention and Effort. Englewood Cliffs, NJ: Prentice Hall.

Kavanagh, D. (1987). Mood, persistence, and success. Australian Journal of Psychology, 39(3), 307-318.

Kavanagh, D., & Hausfeld, S. (1986). Physical performance and self-efficacy under happy and sad moods. Journal of Sport Psychology, 8, 112-123.

Kazdin, A. E. (1982). Single-Subject Research Designs. New York: Oxford University Press.

Kendall, G., Hrycaiko, D., Marint, G. L., & Kendall, T. (1990). The effects of an imagery rehearsal, relaxation, and self-talk package on basketball game performance. Journal of Sport and Exercise Psychology, 12, 157-166.

Klavora, P. (1977). An attempt to derive inverted 'U' curves based on the relationship between anxiety and performance. In Landers, D. M. & Christina, R. W. (Eds) Psychology of Motor Behaviour and Sport. Champaign, IL: Human Kinetics.

Koschak, E. P. (1977). The influence of of music on physical performance of women. Completed. Research In Health, Physical Education & Recreation, 19, 108.

Krischenbaum, D. S., & Bale, R. (1984). Cognitive behavioral skills in sports. Application to golf and speculations about soccor. In Straub, W.F., & Williams, J.M. (Eds) Cognitive Sport Psychology. (pg 275-278). New York: Sport Science Associates.

Lamb, D. (1984). Physiology of Exercise: Responses and Adaptions. New York: Macmillan Publ Corp.

Landers, D. M. (1980). The arousal performance relationship revisited. Research Quarterly for Exercise and Sport, 51, 77-90.

Lee, C. (1982). Self-efficacy as a predictor of performance in competitiive gymnastics Journal of Sport Psychology, 4, 405-409.

Lee, C. (1990). Psyching-up for a muscular endurance task: Effects of Image content on performance and mood state. Journal of Sport and Exercise Psychology, 12, 66-73.

Loehr, J. (1983). The ideal performance state. Science Periodical and Research and Technology in Sport. Ottawa: Coaching Association of Canada.

Manzer, C. W. (1934). the effect of verbal suggestion on output and variability of muscular work. The Psychological Clinic, 22, 248-256.

Martens, R. (1974). Arousal and motor performance. Exercise and Sport Reviews, 2, 155-188.

Marteniuk, R. C. (1976). Information Processing in Motor Skills. New York: Holt, Rinehart & Winston.

Martin, G. (1991). Behavioral Modification. Ontario: Prentice Hall.

Mook, D. G. (1987). Motivation: The organization of Action. New York: W.W. Norton & Co.

Morgan, W. P., & Pollock, M. (1977). In Straub, W.F., & Williams, J.M. (1984). Cognitive Sport Psychology. New York: Sport Science Associates.

Murphy, S. M., Woolfolk, R. L., & Budney, A. J. (1988). The effects of emotive imagery on strength performance. Journal of Sport Psychology, 10, 334-345.

Nelson, D. O. (1963). Effect of selected rhythms and sound intensity on human performance as measured by the bicycle ergometer. Research Quarterly, 34(4), 484-488.

Nelson, L, R., & Furst, M. L. (1972). An objective study of the expectation o competitive performance. Journal of Psychology, 81, 69-72.

Ness, R. G., & Patton, R. W. (1979). The effects of beliefs on maximum weight lifting performances. Cognitive Therapy & Research, 81, 69-72.

Nideffer, R. M. (1985). Athlete's Guide to Mental Training. Champaign. Ill: Human Kinetics.

Nissbett, R. E., & Wilson, T. (1977). Telling more than we can know: Verval reports on mental processes. Psycholoical Review, 84(3), 321-259.

Nowlis, V. (1985). In Thompkins, S. S., & Izard, C. Affects, cognition and personality. New York: Springer.

Oxendine, J. B. (1970). Emotional arousal and motor performance. Quest, 13, 23-30.

Oxendine, J. B. (1984). Psychology of Motor Learning. Englewood Cliffs, NJ: Prentice Hall.

Patton, R. W., Hinton, M. M., Arnold, B. R., & Lessard, B. (1978). Fatigue curves of isokinetic contractions. Archives of Physiology and Medical Rehabilitation, 59, 507-509.

Pearce, K. A. (1981). Effects of different types of music on phyiscal strength. Perceptual and Motor Skills, 53, 351-352.

Peritti, P. O. (1975). Changes in galvanic skin response as affected by musical selection, sex, and academic discipline. The Journal of Psychology, 89, 183-187.

Pignatiello, M. F., Camp, C. J., & Rasar, L. A. (1986). Musical mood induction. An alternative to the Velten technique. Journal of Abnormal Psychology, 95, 295-297.

Rejeski, W. J. (1985). In Kavanagh, D., & Hausfeld, S. (1986). Physical performance and self-efficacy under happy and sad moods. Journal of Sport Psychology, 8, 112-123.

Rider, M. S., Floyd, J. W., & Kirkpatrick, J. (1985). The effect of music, imagery and relaxation on adrenal corticosteroids and the re-entrainment of circadian rhythms. Journal of Music Therapy, 22, 46-58.

Rushall, B. S. (1979). Psyching in Sport. London: Pelham.

Rushall, B. S., Hall, M., Roux, L., Sasseville, J., & Rushall, A. (1988). Effects of three types of thought content instructions on skiing performance. The Sport Psychologist, 2, 282-297.

Scott, D. (1988). Prematch Anxiety Levels and Rates of Injury in Rugby. Unpublished master's thesis, University of Victoria, Victoria, B.C.

Shelton, T. O., & Mahoney, M. J. (1978). The content and effect of "psyching-up" strategies in weight lifters. Cognitive Therapy & Research, 11, 327-336.

Silva, J. M., & Hardy, C. J. (1984). Precompetition affect and athletic performance. In Straub, W. F., & Williams, J. M. (Eds). Cognitive Sport Psychology. New York: Sport Sciences Associates.

Smith, C. A., & Morris, L. W. (1976). Effects of stimulative and sedative music on cognitive and emotional components of anxiety. Psychological Reports, 38, 1187-1193.

Smith, C. A., & Morris, L. W. (1976). Differential effects of stimulative and sedative

music on anxiety, concentration, and performance. Psychological Reports, 41, 1047-1053.

Sonstroem, R. J. & Bernardo, P. (1982). Intrainindividual pregame state anxiety and basketball performance: A reexamination of the inverted "u" curve. Journal of Sport Psychology, 4, 235-245.

Spence, K. W. (1956). Behavioural Therapy and Conditioning. New Haven, CT: Yale Univ Press.

Sutherland, G., Newman, B., & Rachman, S. (1982). Experimental investigations of the relations between mood and intrusive unwanted cognitions. British Journal of Medical Psychology, 55,127-138.

Thaut, M. (1983). The use of auditory rhythm and rhythmic speech to aid temporal and quantitative muscular conrol in children with gross motor dysfunction. Unpublished doctoral dissertation. Michigan State University, East Lansing, MI.

Thayer, R. E. (1967). Measurement through self report. Psychological Reports, 20, 663-678.

Thayer, R. E. (1989).The Biopsychology of Mood and Arousal. New York: Oxford Press.

Tynes, L. L., & McFatter, R. M. (1987). The efficacy of "psyching" strategies on a weight lifting task. Cognitive Therapy and Research, 11(3), 327-336.

Vallerand, R. J. (1984). In Straub, W. F., & Williams, J. M. (Eds.), Cognitive Sport Psychology. (pg 65-78). New York: Sport Sciences Associates.

Velten, E. (1968). A laboratory task for induction of mood states. Behavioral Research and Therapy, 6, 607-617.

Weinberg, R. S. (1982). The relationship between mental preparation strategies and motor performance: A review and critique. Quest, 33(2), 195-213.

Weinberg, R. S. (1985). Relationship between self-efficacy and cognitive strategies in enhancing endurance performance. International Journal of Sport Psychology, 17, 280-292.

Weinberg, R. S. (1988). The Mental Advantage. Leisure Press. Champaign.

Weinberg, R. S. Gould, D., & Jackson, A. (1979). Expectations and performance: An empirical test of Bandura's self-efficacy theory. Journal of Sport Psychology, 1, 320-331.

Weinberg, R. S., Gould, D., & Jackson, A. (1980). Cognition and motor performance: effect of psyching up strategies on 3 motor tasks. Cognitive Therapy and Research, 7, 239-245.

Weinberg, R. S., Gould, D., & Jackson, A. (1981). Relationship between the duration of

the psych-up interval and strength performance. Journal of Sport Psychology, 3, 166-170.

Weinberg, R. S., Gould, D., Jackson, A., & Barnes, P. (1980). Influence of cognitive strategies on tennis serves of players of high and low ability. Perceptual Motor Skills, 50. 663-666.

Weinberg, R. S., Jackson, A., & Seabourne, T. (1985). The effects of specific vs non-specific mental prepartion strategies on strength and endurance performance. Journal of Sport Behavior, 8(4), 175-180.

Weinberg, R.S., Smith, A, Jackson, A., & Gould, D. (1984). Effects of association and dissociation and positive self-talk strategies on endurance performance. Canadian Journal of Applied Sport Sciences, 9, 25-32.

Weinberg, R. S., Yukelson, D., & Jackson, A. (1980). Effect of public and private efficacy expectations on competitive performance. Journal of Sport Psychology, 3, 228-238.

Weiner, B. (1974). Theories of Motivation From Mechanism to Cognition. Chicago: Rand McNaly.

Wilkes, R. S., & Summers, J. J. (1984). Cognitions, mediating variables and strength performance. Journal of Sport Psychology, 6, 351-359.

Woolman, N. (1986). Research on imagery and motor performance: Three methodological suggestions. Journal of Sport Psychology, 8, 135-138.

Wrisberg, C. A. & Anshel, N. H. (1989). The effects of cognitive strategies on the free throw shooting performance of young athletes. The Sport Psychologist, 3, 95-104.

Yerkes, R. M., & Dodson, J. D. (1908). The relationship of strengths of stimulus to rapidity of habit formation. Journal of Comparative Neurology of Psychology, 18, 459-482.

Zaichowsky, L. D. (1980). Single case experimental designs and sport psychology research. In Nadeau, C. H., Hallwell, W. R., Newell, K. M., & Roberts, G. C. (1979). Psychology of motor behavior and sport. Chapaign IL: Human kinetics.

Zeilger, S. G. (1987). Effects of stimulus cueing on the acquisition of ground strokes by begining tennis players. Journal of Applied Behavioral analysis, 20, 405-411.

Zimney, G. H. & Weidenfeller, E. W. (1963). Effects of music upon GSR and heart-rate. American Journal of Psychology, 76, 311-314.

APPENDICES

LIST OF APPENDICES

Appendix A: Informed Consent Form.

Appendix B: Informational Questionnaire

Appendix C: Calibration of Cybex

Appendix D: Instructions for Energizing Techniques

Appendix E: Mood Adjective Check List (MACL)

Appendix F: Activation Deactivation Check List (ADCL)

Appendix G: Follow-up Interview

Appendix H: Pilot Testing

Appendix I: Scheduling for Energizing Intervention

APPENDIX A

Informed Consent Form.

University of Victoria

P.O. Box 1700, Victoria, B.C.

INFORMED CONSENT

For participation in the research project investigation the effectiveness of different psyching up strategies on strength performance.

I understand that ..... participation as a subject is entirely voluntary. No coercion of any kind has been used to obtain my cooperation.

I understand that I may withdraw my consent and terminate my participation at any time during the study.

I understand that all results will remain completely confidential, and that if requested the data will be destroyed after analysis.

Date: ..... Signature: .....

APPENDIX B

Informational Questionnaire.

Name: .....

Age: ..... Home Tel: .....

Height: ..... Weight: .....

Number of years playing field hockey: .....

Highest level of field hockey played: .....

Usual position played: .....

Approximate number of years involved in any form of strength training: .....

Number of years of Study at UVic: .....

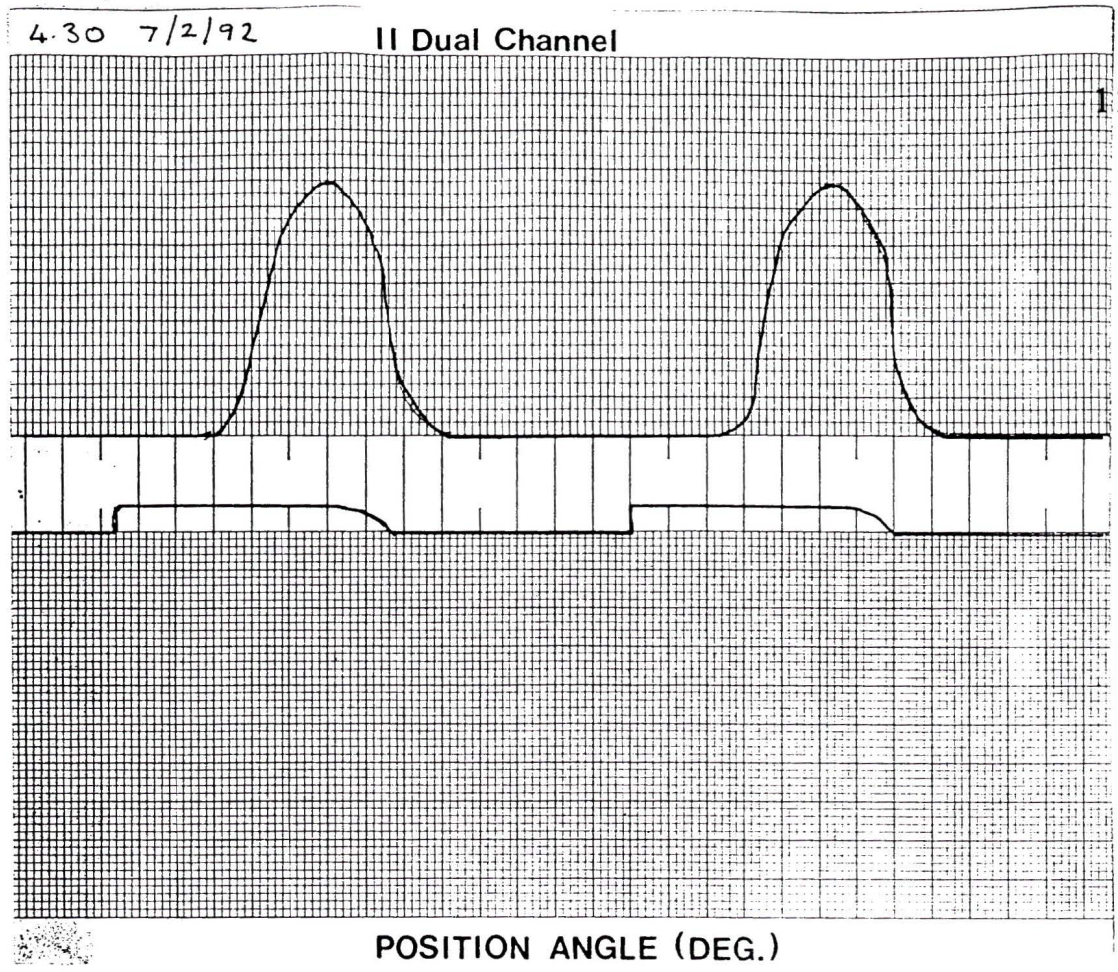
University Program registered for: .....

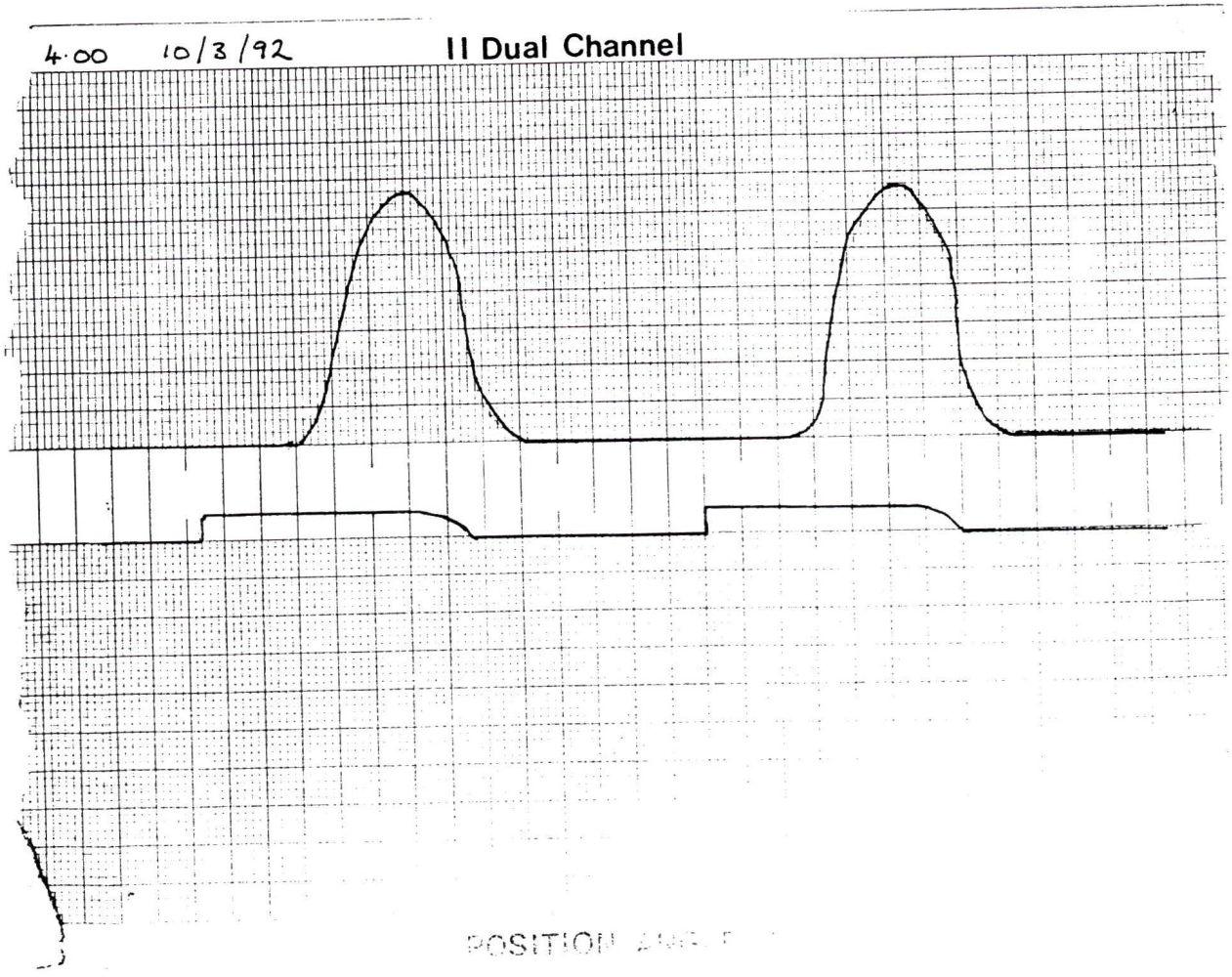
THANK YOU

I HOPE YOU WILL ENJOY PARTICIPATION IN THIS STUDY AND THAT THE TRAINING PROGRAM WILL PROVE USEFUL FOR YOU

APPENDIX C

Calibration of Cybex.


4·30 7/2/92
II Dual Channel
POSITION ANGLE (DEG.)


4·00 10/3/92
II Dual Channel

APPENDIX D

Instructions For Energizing Techniques.

Energizing Techniques

Music - 2 mins of listening to recorded music.

Of the music that you listen or train to which music do you find most energizing?, e.g. while doing weights when a certain peice of music starts playing it makes you feel like you can put even more effort into the weights, or when you are feeling down the music that can lift you up. Select out a couple of peices of this music, those which are most meaningful to you, and bring them along on tape. The music can be of any type as long as it is energizing to you. We'll have 2 minutes to play the music so if it's short bring two peices.

Self-talk - 2 mins of self-talk.

Make a list of all the things that come to mind when you think jof energy, power or strength. They can take any form, words, people, animals or machines. Write down anything that comes to mind;

e.g.	Drive	Tiger	Tyson	Lightening	Bulldozer
	Explode	Ignite	Vise	Bull dog	Thunder
	Speed	Hammer it	Fire	Power	Energize
	All out	Cheetar			
	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....
	.....	.....	.....		

Select out the two or three that create the strongest feeling or association with energy and power when you think them, these are the words which you will repeat to yourself before performing.

Shower - 5 min shower.

You are going to take a quick shower in between your first and second forearm work out, there will be towels there, so just bring gear that is easy to slip in and out of as there's not a great deal of time.

APPENDIX E

Mood Adjective Check List (MACL).

MACL

==========

Each of the following words describe feelings of mood. Please use the list to describe your feelings at the moment you read each word. If the word definitely describes how you feel at the moment you read it, circle it the double check (vv) to the right of the word.

For example, if the word is relaxed and you are definitely feeling relaxed at the moment, circle (vv) as follows:
Relaxed: (vv) v ? NO (This means you are relaxed at the moment.)

If the word only slightly applies to your feelings at the moment, circle the single check (v) as follows;
Relaxed: vv (v) ? NO (This means you feel slightly relaxed at the moment.)

If the word is not clear to you or you can not decide whether or not it applies to your feelings at the moment, circle the question mark as follows;
Relaxed: vv v (?) NO (This means you cannot decide whether you are relaxed or not).

If you definitely decide the word does not apply to your feelings at the moment, circle the no as follows;
Relaxed: vv v ? (NO) (This means you are definitely not relaxed at the moment).

*** Work rapidly. Your first reaction is the best. Work down the first column, then go to the next. Please mark all words. This should take only a few minutes. Please begin: ***

==========

Annoyed	vv	v	?	NO	Carefree	vv	v	?	NO
Elated	vv	v	?	NO	Concentrating	vv	v	?	NO
Sad	vv	v	?	NO	Grouchy	vv	v	?	NO
Witty	vv	v	?	NO	Overjoyed	vv	v	?	NO
Sorry	vv	v	?	NO	angry	vv	v	?	NO
lively	vv	v	?	NO	refreshed	vv	v	?	NO
Attentive	vv	v	?	NO	rebellious	vv	v	?	NO
intent	vv	v	?	NO	Sluggish	vv	v	?	NO
Engaged in thought.	vv	v	?	NO					

==========

APPENDIX F

Activation Deactivation Check List (ADCL).

ACTIVATION-DEACTIVATION ADJECTIVE CHECKLIST (SHORT-FORM)

Each of the words below describes feelings or mood. Please use the rating scale next to each word to describe you feelings *at this moment.*

Examples:

relaxed vv v ? no If you circle the double check (vv) it means that you definitely feel relaxed at the moment.

relaxed vv v ? no If you circle the single check (v) it means that you feel slightly relaxed at the moment.

relaxed vv v ? no If you circle the question mark it means that the word does not apply or you cannot decide you feel relaxed at the moment.

relaxed vv v ? no If you circle no it means that you are definitely not relaxed at the moment.

Work rapidly, but please mark all the words. Your first reaction is best. This should take only a minute or two.

==========

vv = definitely feel
v = feel slightly
? = cannot decide
no = definitely do not feel

==========

active	vv v ? no	placid	vv v ? no
sleepy	vv v ? no	jittery	vv v ? no
energetic	vv v ? no	intense	vv v ? no
calm	vv v ? no	tired	vv v ? no
vigorous	vv v ? no	at-rest	vv v ? no
drowsy	vv v ? no	fearful	vv v ? no
lively	vv v ? no	still	vv v ? no
wide-awake	vv v ? no	clutched-up	vv v ? no
quiet	vv v ? no	full of pep	vv v ? no
tense	vv v ? no	wakeful	vv v ? no

==========

APPENDIX G

Follow-up Interview.

Name:..... Date:.....

1. "What type of preparation would you use generally use prior to strength tasks?"

.....

.....

2. "Did you find the music, shower and self-talk helped you to perform better than no preparation?"

.....

.....

"How did you find the reading backwards effected you?"

.....

.....

"After reading backwards how well were you able to get your thoughts together to perform maximally over the 6 trials?"

.....

.....

3. "Did you generally feel you could generate more strength on your first or second trial? Why?"

.....

4. "Did the music, shower and self-talk make you feel like you could generate more strength?"

.....

5. "Which technique; music, shower or self-talk did you feel was most effective for you?"

.....

.....

.....

6. "Did you feel you were able to use the pre-performance techniques to feel more energized:-

- Music

1	2	3	4	5	6	7	8	9	10	11
Not at all										Extremely

- Shower

1	2	3	4	5	6	7	8	9	10	11
Not at all										Extremely

- Self-talk

1	2	3	4	5	6	7	8	9	10	11
Not at all										Extremely

"How did you feel being energized helped you to perform better?"

.....

.....

Did it help your attentional focus to perform the task? .....

Did it help your arousal level ? .....

Did it help your confidence to preform the task ? .....

Did it help you exert more effort? .....

7."Did you feel that music, shower and self-talk produced different types of changes? Yes / No

If so what kind?

.....

.....

Music

a) To what degree did music focus your attention to perform the task?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

b) To what degree did music increase your arousal level?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

c) To what degree did music aid your confidence to perform the task?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

d) To what degree did music help you to exert effort to perform the task?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

Shower

a) To what degree did showering focus your attention to perform the task?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

b) To what degree did showering increase your arousal level?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

c) To what degree did showering aid your confidence to perform the task?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

d) To what degree did showering help you to exert effort to perform the task?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

Self-talk

a) To what degree did self-talk focus your attention to perform the task?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

b) To what degree did self-talk increase your arousal level?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

c) To what degree did self-talk aid your confidence to perform the task?

1 2 3 4 5 6 7 8 9 10 11
Not at all Extremely

d) To what degree did self-talk help you to exert effort to perform the task?

1	2	3	4	5	6	7	8	9	10	11
Not at all										Extremely

8. "Did you find the techniques effected you in a consistent manner, or did your response to the technique vary from day to day?"

.....

9. "When you filled out the energy/feeling scales, was the second response largely effected by just having performed two maximal trials or related more to the music etc?

.....

8. "How could the pre-performance techniques have been made more effective?

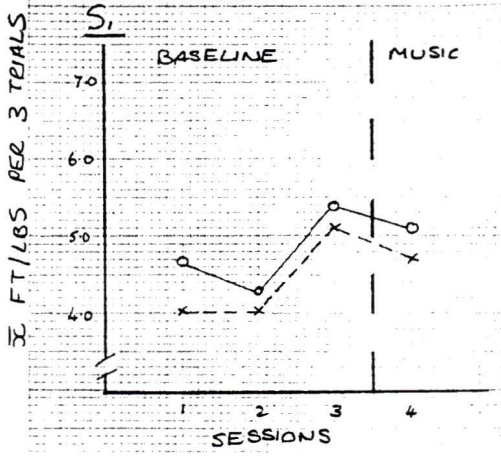
.....

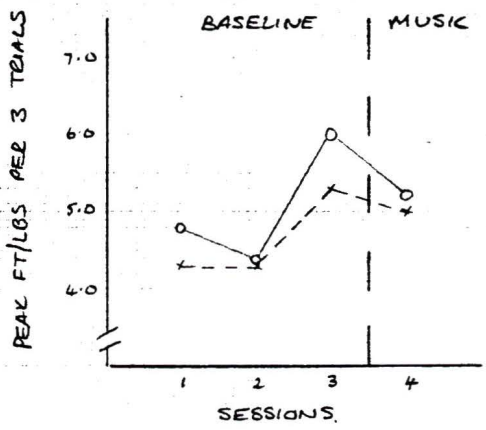
APPENDIX H

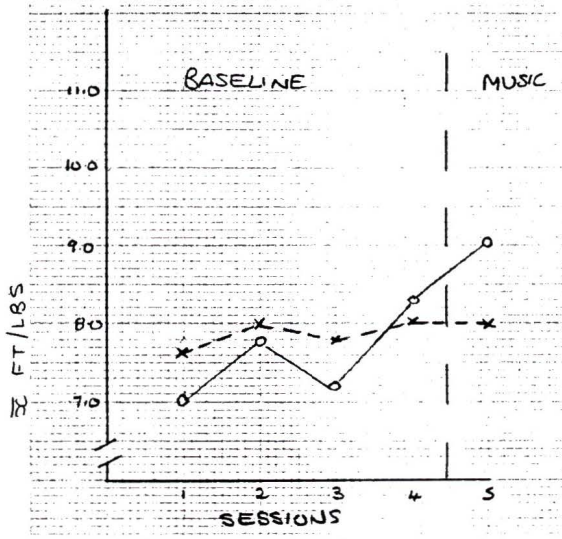
Pilot Testing.

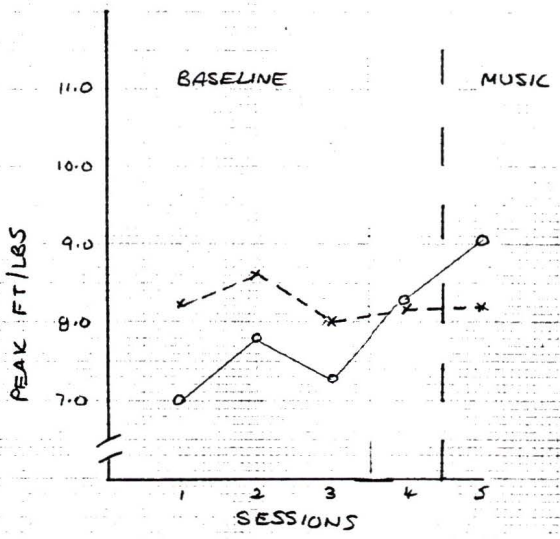
SUPINATION OF THE FOREARM

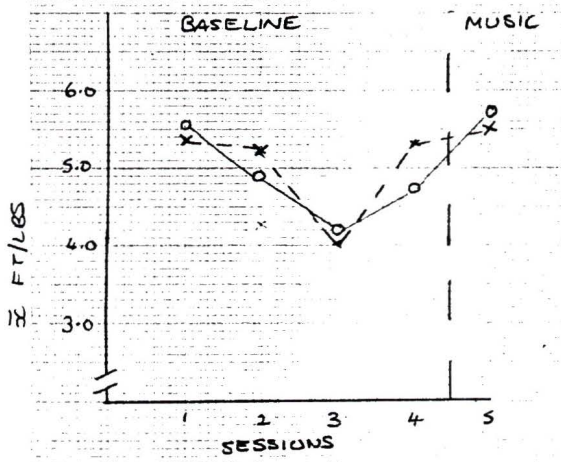
S1

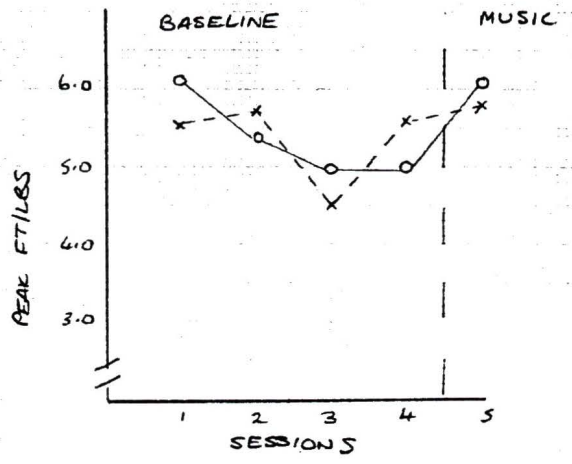












APPENDIX I

Scheduling for Energizing Interventions.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week7
Carmen	M S ST	S ST M	ST S M	ST S M	S M ST	M S ST	ST S M
Milena	S ST M	S M ST	S ST M	ST M S	S ST M	M ST S	ST S M
Gillian	M S ST	M S ST	ST S M	M S ST	S M ST	S ST M	M S ST
Kolette	S ST M	ST M S	ST S M	M ST S	M S ST	S ST M	ST S M
Nicole	ST S M	M ST S	M ST S	S ST M	M S ST	M ST S	M S ST
Cara	M S ST	S ST M	S M ST	S ST M	ST S M	ST S M	S M ST

M = Music

S = shower

ST = Self-Talk

VITA

Surname: MOSSMAN Given Names: SUSAN ELAINE

Place of Birth: BRISTOL (UK) Date of Birth: 9-7-67

Educational Institutions Attended:

West London Institute of Higher Education	1985-1988
University of Victoria	1989-1992

Degrees Awarded:

B.Sc. (Joint Honors) W.L.I.H.E. 1988

Honors and Awards:

University of Victoria Fellowship	1989-1991

PARTIAL COPYRIGHT LICENSE

I hereby grant the right to lend my thesis to uses of the University of Victoria Library, and make single copies only for such users or in response to a request from the Library of any other university, or similar institution, on its behalf or for one of its users. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by me or a member of the University designated by me. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my permission.

Title of Thesis: The Effects of Energizing on Strength Performance.

Author: [redacted]
(Signature)

SUSAN ELAINE MOSSMAN
(Name in block letters)

27-7-92
(Date)