

Preliminary Investigation of Autonomy in Adolescent Survivors
of Traumatic Brain Injury

by

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BA, University of Minnesota, 1997
MA, University of Victoria, 2001

A Dissertation Submitted in Partial Fulfillment of the
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Abstract

Objective: The primary goal of this study was to investigate the possibility of a relationship between traumatic brain injury (TBI) and adolescent autonomy. Adolescents and their parent reported on three types of autonomy; reflective autonomy, reactive autonomy, and functional independence. Adolescent cognitive skills, reading ability, and affective states, along with parent perceptions of the adolescents' executive functioning and parent-related stress were assessed in an attempt to elucidate the mechanisms through which TBI and autonomy interact.

Participants and Methods: Participants included 20 adolescents, 12 to 19 years of age, with a history of TBI and 19 age- and gender-matched adolescents with no history of TBI. Each adolescent was accompanied by one parent who completed parental reports while the adolescent underwent testing and completed questionnaires. Adolescents were screened for cognitive functioning and reading ability using subtests of the Reynolds Intellectual Assessment Scale (RIAS) and the Wide Range Achievement Test – 4th

Edition (WRAT4). Adolescents then completed questionnaires to assess depression (Beck Depression Inventory – 2nd Edition, BDI-II) and anxiety (Beck Anxiety Inventory, BAI). Lastly but most importantly, the adolescents completed questionnaires to assess reflective autonomy using a modified version of the Ryff Psychological Well Being Scale, and reactive autonomy (Adjectives Checklist, ACL). Meanwhile, parents completed a brief demographics questionnaire, a report of their adolescent's functional independence (Adaptive Behavior Assessment System II, ABAS-II), executive functioning (Behavior Rating Inventory of Executive Functioning, BRIEF), and parenting-related stress (Stress Index for Parents of Adolescents, SIPA).

Results: Significant group differences were noted on measures of reflective autonomy, but not on reactive autonomy. A history of TBI was also influential in parent ratings of functional independence and executive functioning, but not levels of parent stress. The adolescents with TBI did not report higher levels of depression or anxiety. Within the TBI group, significant correlations were found between parent ratings of adolescent functional independence and executive functioning, yet no correlations were found between adolescent and parent reports of autonomy, adolescent reports of autonomy and affect, or between parent ratings of adolescent functional independence/executive functioning and parent stress levels.

Conclusions: These findings provide some indication of a potential relationship between TBI and both self-reports and parent reports of autonomy. Adolescents with a history of TBI in this sample felt less in control of their decision making process regarding actions/behaviors, and were viewed by their parents as are less functionally independent. These findings do not provide any indication of a potential relationship between TBI and

an adolescent's ability to resist external influence. However, the number of participants was limited and there were several other factors which complicate the interpretation of this lack of difference between adolescents with and without TBI. Clearly, further investigation of this phenomenon is warranted, yet these findings suggest that clinicians working with adolescents with brain injury might benefit by considering both internal and external perceptions of autonomy in treatment implementation.

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Dedication

To Gary Lars Kodalen

1933-2010

I did it Dad. I really did it.

&

To Kevin, Audrey, and Helen

That's "Dr." Daddy to you.

Introduction

Adolescents with traumatic brain injury (TBI) represent a unique clinical challenge for psychologists. During a key period of development, adolescents undergo dramatic physical, cognitive, and psychosocial change. They strive to establish autonomy – a greater sense of control over their lives which includes greater independence from their parents and other persons of authority. The introduction of a TBI, which by its very nature can leave a person dependent on help from others (Dumas, Haley, Bedell & Hull, 2001; Prigatano, 2008), adds a new layer of complexity to the universal paradox of adolescence; balancing the desire for internal self-sufficiency with the need for external support. Thus, the challenge for the clinician is to discern the extent to which TBI may affect the ongoing process of adolescent transformation, so as to ensure that development can proceed as normally as possible. To date however, investigations into the psychosocial consequences of adolescent TBI have received much less attention than have investigations into the biological and cognitive consequences of adolescent TBI.

Adolescence

Above all else, adolescence represents a time of significant physical, cognitive and psychosocial growth (Dahl, 2004; Oetzel & Scherer, 2003; Steinberg, 2002; Weisz & Hawley, 2002). Spanning the ages 12 to 19 (Spear, 2000), adolescence represents the transition from childhood dependency to adult independence (Dahl, 2004; Graber & Brooks-Gunn, 1996; Santrock, 2005). During this time the individual experiments with new ways of thinking, feeling, and behaving as they seek to better understand themselves and the world around them (Kelley, Schochet, & Landry, 2004; Cole et al, 2001). While the majority of adolescent experimentation leads to positive growth and a greater

understanding of one's values (Arnett 1999; Williams et al, 2002), such experimentation also increases the risk for negative outcomes and trajectories (Eaton et al, 2010).

As with all phases of human development, significant variability exists within and between individuals. At this stage of development however, large discrepancies between physical, cognitive, or psychosocial maturation can have a profound effect on day-to-day functioning. For example, an adolescent with early physical development (i.e., secondary sexual characteristics) but delayed cognitive maturation (i.e., foresight and planning) may easily find themselves ill-equipped to handle potentially risky novel situations. Experimentation with drugs at a time when internal neurocircuitry is especially vulnerable to addiction can increase the likelihood of developing a substance use disorder (Chambers, Taylor, & Potenza, 2003). Likewise, the repeated exposure to risky situations and/or interactions with others, a very real possibility during this period of development (Kelley et al, 2004), could result in negative adjustment (Dahl, 2004; Santrock, 2005; Steinberg, 2005). The unique topography of an adolescent's growth and adaptation to their environment depends in part on the achievement of physical, cognitive, and psychosocial milestones, the variability in level of growth, and discrepancies in ability across domains.

Physical Changes.

From a physical perspective, adolescence is initiated by major hormonal and bodily changes which signal the onset of the sexual maturation process (Dahl, 2004; Santrock, 2005). Physical aspects of puberty including growth spurts, hormone level fluctuations, and the development of secondary sexual characteristics, influence all aspects of the adolescent's day-to-day life (Weisz & Hawley, 2002).

Regarding physical changes to the adolescent brain, synaptic connections increase in some regions (synaptogenesis), decrease in others (pruning), and overall signal conduction within and between cortical areas improves (myelination; Giedd et al, 1999; Sowell, Delis, Stiles, & Jernigan, 2001; Straunch, 2003). The overall brain volume remains consistent, but the distribution of gray and white matter shifts across cortical regions (Giorgio et al, 2010; Ciccia, Meulenbroek, & Turkstra, 2009; Giedd, 2004; Straunch, 2003). White matter volume changes, thought to be related to increased myelination and faster speed of processing (Paus et al, 1999) have been identified in the arcuate fasciculus and corticospinal tract (Giorgio, et al, 2010), the corpus callosum (Durstun et al, 2001), and frontal, parietal, and occipital lobes (Sowell, Trauner, Gamst, & Jernigan, 2002). Substantial gray matter reductions identified in the frontal, parietal, and temporo-occipital lobes (Sowell et al, 1999; Sowell et al, 2001) can continue on into early adulthood.

Cognitive Changes.

From a cognitive perspective, adolescent maturation is marked by enhanced problem solving, greater mental flexibility, and improved behavior regulation (Goldberg, 1996; Levin et al, 1997; Taylor, 2004). Adolescents modify previously established skills through the use of new found abilities (Spear, 2000). For example, language skills developed during childhood expand via improved comprehension and a greater awareness of subtle nuances in prose and meter. Likewise, adolescents begin to apply new approaches to gathering information and interacting with their environment (Goldberg, 1996; Hux, Bond, Skinner, Belau, & Sanger, 1998; Levin et al, 1997; Taylor, 2004). The increase of academic and social demands necessitates greater functional

independence and the application of abstract reasoning skills (Cattelani, Lombardi, Brianti, & Mazzucchi, 1998).

Psychosocial Changes.

From psychological and social perspectives, adolescence is characterized by a striving for greater emotional independence in a time of greater emotional vulnerability (Dahl, 2004). Adolescents experience increased complexity in their interpersonal relationships (Inglés, Hidalgo, & Méndez, 2005), they develop a more stable self-identity (Jacobs, Bleeker, & Constantino, 2003) and they learn to better regulate affect and behavior (Campos, Frankel, & Camras, 2004; Steinberg, 2005; Keyes, 2006). They are introduced to complicated new issues like substance use, peer pressure, sexual activity, aggression, and increased parent-child conflict, all of which can lead to negative adjustment (Weisz & Hawley, 2002; Zahn-Waxler, 1996).

According to developmental theorist Erik Erikson, the primary task of adolescence is a search for personal identity (Muus, 1989). During this time, they experience a conflict between an internal yearning for independence and an external pressure for assimilation. The adolescent is believed to resolve this conflict by gaining a better understanding of their personal strengths and weaknesses and making choices about how to make use of them (Steinberg, 2002). The adolescent's ability to integrate everyday contradictions (e.g., good insight vs. risky choices, reliable support network vs. abusive relationships, etc.) with their personal values and society's expectations plays a key role in their developmental trajectory (Allen et al, 2002) and overall psychological well-being (Max et al, 1999).

Autonomy

One psychosocial aspect of development closely linked to identity is the formation of autonomy. Although autonomy is considered one of the most important factors relating to success in emerging adulthood (Masten et al, 2004; Spear & Kulbok, 2004; Turner, Irwin, Tschann, & Millstein, 1993) reaching agreement on a universal definition of the construct has been a topic of much controversy (Hmel, & Pincus, 2002; Koestner & Losier, 1996; Turner et al, 1993). The literal translation of autonomy is “self-law,” yet defining it as a psychological construct has been a more difficult task due to its diverse theoretical background (Noom, Deković, & Meeus, 2001). In the past, the label “autonomy” has been applied to seemingly contrarian theories (e.g., a reflexive opposition to any outside influence vs. an evaluation of the continuity between outside influences and internal schema; Koestner & Losier, 1996). As with most psychological constructs, a useful definition ultimately depends upon the aim of the researcher and the context of its evaluation.

In reference to adolescent development, three broadly defined, theoretically-derived, first-order constructs of autonomy (or “self-governance”) have been established: emotional autonomy (the ability to feel autonomously), cognitive autonomy (the ability to think autonomously), and behavioral autonomy (the ability to act autonomously; Beckert, 2007; Friedman, Holmbeck, DeLucia, Jandasek, & Zebracki, 2009; Spear & Kulbok, 2004). Emotional autonomy relates to aspects of separation, e.g., separation from parents, separation from childhood values and beliefs, etc, experienced during adolescence (Lamborn & Steinberg, 1993). Behavioral autonomy encompasses self-reliant and internally motivated behaviors along with the adolescent’s capacity for

independent decision making (Garber & Little, 2001). Cognitive autonomy is applied within the context of social-cognitive development, addressing aspects of perspective taking and social reasoning skills (Beckert, 2007). Autonomy during adolescence is usually defined in terms of self-governance, self-regulation, and independence, but not as freedom from appropriate limits set by parents (Turner et al, 1993).

Within the realm of personality psychology, autonomy is closely linked to how one reacts to external influence (Koestner et al, 1999; Koestner & Losier, 1996). That is, based largely on Murray's (1938) theory of personality, autonomy is conceptualized as an individual's capacity to resist external influence. In this interpretation, a person who is autonomous is a person who is able to avoid coercion and prefers to march to their own drum beat. This early conceptualization of autonomy, termed "reactive autonomy" by Koestner & Losier (1996) contrasts with another conceptualization of autonomy, labeled "reflective autonomy," which is drawn from Ryan and Deci's (2000) self-determination theory (SDT). In this conceptualization, autonomy is seen as the degree to which one feels an internal locus of causality over their choices and/or actions. In other words, whereas reactive autonomy represents the *interpersonal* process of reacting to external influences, reflective autonomy represents the *intrapersonal* process of weighing both internal and external influences and using that input to determine a course of action (Koestner et al, 1999; Koestner & Losier, 1996; Ryan & Deci, 2006). In this study, both reflective and reactive autonomy were assessed through adolescent self-report.

Regardless of the context, there is agreement that autonomy is a vital psychosocial construct. Social psychologists view autonomy as a component of psychological well being (Ryan & Deci, 2000; Ryff, 1989). Developmental psychologists

view autonomy as an important milestone of adolescent growth (Hmel & Pincus, 2002; Noom, et al, 2001; Collins, Laursen, Mortensen, Luebker & Ferreira, 1997; Allen, Hauser, Bell & O'Connor, 1994; Steinberg & Silverberg, 1986), specifically, as a marker in the identity formation process where the individual moves from dependence towards independence (Collins & Steinberg, 2006).

Adolescent autonomy has been examined in typically developing populations as a function of self-perception (Allen et al, 1994; Lichtwarck-Aschoff, Kunnen & van Geert, 2010), parent-child relationships (McElhaney & Allen, 2001; Mullis, Graf, & Mullis, 2009), and overall family functioning (Fuhrman & Holmbeck, 1995). Disruptions in the development of adolescent autonomy have been described in cases of Type 1 diabetes (Butner et al, 2009; Dashiff, Vance, Abdullatif, & Wallander, 2009), spina bifida (Friedman et al, 2009), learning disabilities (Murtaugh & Zetlin, 1990) and physical disabilities (Holmbeck et al, 2002), yet on the whole, much less attention has been paid to challenges of autonomy development for adolescents with chronic illnesses and/or disability (Friedman et al, 2009). Despite being identified as a prerequisite for effective participation in the rehabilitation process for adults with physical disabilities (Cardol, De Jong, & Ward, 2002), thus far little attention has been paid to the potential impact of adolescent traumatic brain injury (TBI) on autonomy.

The present study assessed the relationship between TBI and both reflective and reactive autonomy. The study also examined the relationship between TBI and a related construct of autonomy, functional independence, which reflects an adolescent's capacity to meet the daily challenges of independence (Noom et al, 2001). Functional independence was included for two reasons. First, ratings of functional independence

provide the most concrete measure of an adolescent's capacity to self-govern. Second, its inclusion provides an ideal means of including parent perceptions of the impact of TBI on autonomy. Parents/caregivers have a unique role in the TBI rehabilitation process as intimate observers of, and frequent participants in, the adolescent's day-to-day functioning.

Traumatic Brain Injury

The term "traumatic brain injury" (TBI) is applied when the rapid movement of the head results in an altered level of consciousness accompanied by neuro-imaging and/or neurobehavioral assessment evidence of a neurological deficit (Bigler & Clement, 1997). TBIs are rated in terms of severity (e.g., mild, moderate, or severe) and defined by the physical characteristics of the injury (e.g., closed or penetrating, focal or diffuse). While these labels are helpful in cataloging prevalence rates (Langlois, Rutland-Brown, & Thomas, 2004), they are less adept at capturing the idiosyncratic nature of a TBI.

Adolescents make up a significant portion of annual reported cases of TBI (Cattalani et al, 1998; Gil, 2003; Langlois et al, 2004; Max et al, 1998; Ponsford et al, 2000; Yeates et al, 1997). Estimates suggest 180 to 250 out of every 100,000 children and adolescents experience a TBI over the course of one year (Adelson & Kochanek, 1998). Part of the reason adolescents with TBI represent such a difficult challenge for clinical psychologists is the significant variability of neurobehavioral profiles across individual cases (Newman, Garmoe, Beatty, & Ziccardi, 2000; Trauner, Nass, & Ballantyne, 2001). Depending on where, when, and how damage occurs, the consequences of TBI may range

confusion to severe disability and/or death (Gagnon, Swaine, Freidman, & Forget, 2004; Middleton, 2001; Viguiet, Dellatolas, Gasquet, Martin, & Choquet, 2001).

The types and scope of damage following TBI is highly variable. For adolescents, closed head injuries (CHI) are more common than penetrating head injuries (PHI; Ewing-Cobbs et al, 2003), which means a greater likelihood of diffuse axonal injury (DAI; Adelson & Kochanek, 1998; Goldberg, 1996), in which the fibers connecting the neurons are damaged over widespread areas of the brain. "Shearing", a main cause of DAI, occurs when one layer of cortical tissue slides over another, resulting in the destruction of cell bodies and the ripping of axons in the corpus callosum, subcortical white matter and brainstem (Bigler, 2001; Povlishock, 1989). The violent jarring of the brain can also rupture blood vessels, which in turn disrupts the flow of oxygen and glucose to neurons causing cell death for the surrounding tissue (Jantz & Coulter, 2007). If left unchecked, bleeding within cortical tissue or between the brain and skull will create hematomas which press against and damage neural tissue (Bigler, 2001). A spike in intracranial pressure (ICP) which stems from cerebral edema (the release of vesicle or intracellular fluid into cerebral tissue) can lead to further damage and/or death of cortical tissue (Adelson & Kochanek, 1998; Bigler & Clement, 1997). Cerebral contusions, a consequence of the brain striking the skull's bony internal architecture, are most often seen in the areas of the anterior poles and ventral surfaces of the temporal lobes as well as the anterior and ventral surfaces of the frontal lobes (Ewing-Cobbs, Barnes, & Fletcher, 2003). Regardless of the mechanism of injury, however, it is possible for long-term physical, cognitive, and emotional impairment to accompany even mild to moderate injuries (Adelson & Kochanek, 1998; Gagnon et al, 2004; Jantz & Coulter, 2007).

Psychologists working with adolescents with TBI must also contend with individual variability in established skills and abilities. Cognitive and/or psychosocial limitations which do not correspond with the client's chronological age are not always a direct consequence of the brain injury (Luna, Garver, Urban, Lazar, & Sweeney, 2004), yet they can still influence the client's recovery from brain injury (Dumas et al, 2001; Prigatano, 2008; Lezak, 1995). It was long assumed that the younger the individual at the time of injury, the greater the likelihood of a complete recovery (Anderson, Catroppa, Morse, Haritou, & Ronsensfeld, 2000; Yeates et al, 2004). This was based primarily on Kennard's work with very young primates which demonstrated young primates brains' were better equipped to cope with injury as compared to the brains of mature primates (Eslinger & Biddle, 2000; Levin, 2003; Verger et al, 2000; Wright & Limond, 2004). Current consensus however, is that the converse is actually more likely; the younger one experiences brain trauma, the greater the chances for residual impairments and a poorer trajectory (Anderson et al, 2000; Chapman & McKinnon, 2000; Gil, 2003; Jonsson, Horneman, & Emanuelson, 2004). Significant improvements in methodology and technology over the last decades (Anderson, Fenwick, Manly, & Robertson, 1998; Dennis, 2000; Viguier et al, 2001), have led to the conclusion that developing skills and abilities are more susceptible to disruption than established skills and abilities (Anderson et al, 2000; Gil, 2003; Taylor & Alden, 1997). For maturing adolescents, residual complications from a TBI can interfere with their ability to maintain age-appropriate rates of development (Dumas et al, 2001; Hawley, Ward, Magnay & Mychalkiw, 2004).

Common TBI cognitive sequelae and Autonomy.

Adolescents with TBI frequently demonstrate impairments in overall cognitive ability including attention, memory, learning, language, and executive functions (H. S. Levin, 2003; Taylor, 2004; Taylor & Alden, 1997; Vanderploeg, 2000; Yeates et al, 2004; Yeates et al, 1997). Impairments in these areas can affect previously established skills and abilities, yet they can also interfere with the acquisition of new skills and abilities (Laurer, Lenzlinger, & McIntosh, 2000). Of particular concern in this study is the potential impact of common TBI cognitive sequelae on the expression of different types of adolescent autonomy.

Cognitive ability.

Long term deficits in overall level of cognitive functioning are not uncommon following TBI (Beers, 1992; Hessen, Nestvold, & Sundet, 2006; Wood & Rutterford, 2006) and presumably influence an adolescent's ability to function autonomously. Overall, the degree of cognitive deficits an adolescent with TBI is likely to experience is positively correlated with the severity of their injury (Arroyos-Jurado, Paulsen, Ehly, & Max, 2006). In the acute stages of TBI, non-verbal cognitive abilities, especially those reliant on the efficient processing of information are frequently disrupted (Miller & Donders, 2003; Tremont, Mittenberg, & Miller, 1999). The relationship between autonomy and cognitive ability following TBI has received little attention to date. In the present study, overall intelligence, as reflected by an evaluation of verbal and non-verbal components of cognitive functioning, will be assessed to ensure the participants possess the requisite skills to comprehend questionnaires of autonomy, to provide more complete

descriptions of the participant groups from a neurocognitive perspective, and to provide a basis for exploring any relationship between IQ and adolescent autonomy after TBI.

Attention.

Presumably, functional independence and the ability to act autonomously require individuals to be able to focus and shift their attention appropriately. The abilities to focus and/or to shift one's attention are frequently impaired following TBI (Kinsella, 1998). Attention is a basic cognitive function (Fletcher, 1998) yet it is based on a complex neurological process and reliant upon the interaction of several discrete cortical regions (Anderson et al, 1998; Ewing-Cobbs et al, 1998; Fenwick & Anderson, 1999; Kinsella, 1998). As a result, a diffuse brain injury (i.e., the type most commonly seen in adolescents) can simultaneously interfere with multiple aspects of attention. Focused attention is typically well established by mid-childhood (Ewing-Cobbs et al, 1998); yet sustained attention, divided attention, and response inhibition generally do not reach full maturity until early to mid adolescence (Anderson et al, 1998; Jonsson et al, 2004; Luna & Sweeney, 2004). Lending support to the argument that emerging cognitive skills are more vulnerable to impairment than established cognitive skills, young adolescents with a TBI are more likely to report short attention spans, an inability to effectively accomplish simultaneous tasks, and high distractibility rather than problems focusing in on the most important information (Jonsson et al, 2004; Kinsella, 1998). While problems with attention clearly interfere with an individual's ability to independently manage their own affairs (Mateer, Kerns, & Eso, 1996), at this time, the relationship between TBI related deficits in attention and adolescent reflective and reactive autonomy are not well understood.

Memory and Learning.

Impairments in memory and learning, both well established sequelae of adolescent TBI (Jonsson et al, 2004; Roncadin, Guger, Archibald, Barnes, & Dennis, 2004; Sohlberg & Mateer, 2001), are likely to fundamentally interfere with an adolescent's ability to function autonomously. In the broadest sense, the encoding, storage, and retrieval of previous experience allows an individual to adapt to brand new experiences (Ewing-Cobbs, Barnes et al, 2004, Wright & Limond, 2004). If this process is disrupted, individuals are more likely to struggle with novel situations (Lezak, 1995; Straunch, 2003) and become dependent on external sources of support to help them adjust. For an adolescent already striving for greater independence, such dependence can lead to negative self-evaluations (Siegel, 2001) and a poorer psychosocial adjustment (Kupfer & Woodward, 2004; Zahn-Waxler, 1996). Neuroimaging evidence for the physical maturation of key memory neural systems during adolescence (Moran and Gillan, 2004; Sowell et al, 2001) suggest memory is a key contributor to adolescent cognitive development, however, the specific effect of memory and learning impairments on adolescent autonomy following TBI has not been studied.

Language.

The ability to effectively use language in order to understand others and communicate one's wants and needs would appear central to all types of autonomy. Like adults, adolescents use language to engage with the world around them. Cognitively, adolescents use language to explore and better understand the environment, guide thinking, sharpen memories, organize perceptions, and most importantly, facilitate learning (Santrock, 2005). Socially, adolescents use language to develop friendships,

gain acceptance, strengthen relationships, and convey internal expectations of others, wants, needs, and beliefs (Spear, 2000).

Following TBI, the degree of that impairment depends on a combination of developmental timing and the severity and locus of damage (Lezak, 1995). Moran and Gillan (2004) argue that because language is but one component of the larger communication system, complementary aspects such as semantic memory ability, working memory, and vocabulary must also be assessed before drawing conclusions about the full impact of a TBI on an adolescents' ongoing development. An injury sustained prior to adolescence might dramatically impair language development, whereas the effects of an injury sustained during adolescence may be less obvious based on language skills (Moran & Gillian, 2004). For example, adolescents with TBI are more inclined to demonstrate subtle problems with higher order language skills (e.g., verbal reasoning) than difficulty with basic syntax (Middleton, 2001; Jonsson et al, 2004). An adolescent with TBI may also struggle with poorer reading comprehension (Ewing-Cobbs et al, 2004), difficulties with organizing information and extracting the main point (Chapman, McKinnon, Levin, Song, Meier, & Chiu, 2001), and problems generating coherent written narratives (Wilson and Proctor, 2002). In the present study, a key aspect of language skill, reading ability, will be evaluated to ensure the participants possess sufficient ability to comprehend and respond to self-report measures of autonomy and affect.

Executive Functions.

The "executive functions," a set of inter-related higher-order cognitive abilities which emerge during adolescence (Pentland, Todd, & Anderson, 1998), are the basis for

metacognitive skills such as the ability to self monitor performance on complex and highly demanding tasks (e.g., in social interactions; Ciccia, Meulenbroek & Turkstra, 2009). Executive functions guide long-term goal-directed behaviors (Anderson, 2002; Ewing-Cobbs et al, 1998; Ewing-Cobbs, Prasad et al, 2004; Gioia & Isquith, 2004), assist with adaptive functioning (Yeates et al, 2004), and enable the self-regulation of behavior (Gioia & Isquith, 2004; Selznick & Savage, 2000). Executive functions encompass attentional and impulse control, working memory, mental flexibility, activity initiation, maintenance of a mental set, and the ability to effectively implement appropriate strategies (Anderson, 2002; Ewing-Cobbs et al, 2004; Levin, Hanten, Zhang, Swank, & Hunter, 2004; Rosso, Young, Femia, & Yurgelun-Todd, 2004). Consequently, it is reasonable to deduce that impaired executive function, a common sequelae of TBI, would directly affect each type of adolescent autonomy addressed in this study.

Common behavioral (e.g., poor self control) and emotional (e.g., erratic mood swings) effects of frontal lobe damage can easily disrupt the acquisition of new knowledge and are known to interfere with academic performance (Gioia & Isquith, 2004; Marlowe, 2000; Pentland et al, 1998; Slomine et al, 2002). In adolescence, executive dysfunction may manifest as distractibility, impulsivity, poor problem solving skills, poor use of feedback, and an inflexibility in thought processes (Anderson et al, 2001; Barrash, Tranel, & Anderson, 2000). Problems in any one of these areas are likely to influence the adolescent's response to the input of others (i.e., reactive autonomy), their ability to acknowledge and act upon their own goals (i.e., reflective autonomy), and their ability to meet the day-to-day demands of independent living (i.e., functional independence).

Unfortunately, assessment of executive dysfunction in adolescents with TBI is not a straightforward task. Clinicians must differentiate between a general lack of interest, basic skill deficits, or more global impairments when identifying the cause of an adolescent's "executive" deficit (Gioia & Isquith, 2004; Ylvisaker, Szekeres, & Feeney, 1998). Familiar adolescent behaviors which may mimic executive dysfunction on the surface (e.g., distractibility, impulsivity, poor use of feedback, etc), could be a function of personality rather than injury. Likewise, by virtue of executive function's multidimensional nature, separating executive abilities from domain-specific functions is not always straightforward (Brookshire, Levin, Song, & Zhang, 2004; Levin, Song, Ewing-Cobbs, & Roberson, 2001; Levin et al, 1997). Neurological impairment which limits a specific cognitive skill set (e.g., list learning, response inhibition, sustained attention, etc), for example, could erroneously suggest global executive dysfunction (Lezak, 1995). Conversely, a satisfactory performance focused on one specific skill does not automatically preclude the possibility of executive dysfunction (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001; Slomine et al, 2002).

Standardized assessment procedures themselves can also mask executive dysfunction in adolescents with a history of TBI. Highly structured sessions in which the goals, organization, expectations, and pace are all defined and controlled by the examiner could result in an overestimate an adolescent's true ability (Anderson et al, 2001; Pentland et al, 1998; Slomine et al, 2002). Because of that, very real and highly debilitating problems with organization, initiation, and motivation may not surface until the adolescent is observed outside of the testing environment. In an effort to overcome

these limitations, a greater emphasis has been placed on the ecological validity of executive functioning measurement (Giola & Isquith, 2004; Silver 2000).

Measures such as the Behavior Rating Inventory of Executive Function (BRIEF; Giola & Isquith, 2004) were developed to capture information about the manifestations of executive dysfunction in the adolescent's everyday behaviors at home. Using the BRIEF, parent observations of executive function will contribute to the investigation of executive dysfunction and autonomy following TBI.

Common Affective Sequelae and Autonomy.

Just as there can be sweeping cognitive consequences of a TBI, there can also be far-reaching emotional consequences from a brain injury. Adolescents with TBI may experience long term problems with affect regulation (Geraldina et al, 2003) or reactivity (Holbrook et al, 2003). In addition to practical, financial, and physical demands of caring for a son/daughter with TBI, parents may also face a disruption in family dynamics (Montgomery, Oliver, Reisner, & Fallat, 2002; Wade et al, 2003) and increased stress levels (Benn & McColl, 2004; Hawley, Ward, Magnay & Long, 2009; Wade et al, 2003). Just as with the cognitive sequelae described previously, of particular concern here is the potential impact of TBI affective sequelae on the acquisition of functional independence and reactive and reflective autonomies for the adolescent.

Adolescent Affective States.

Depressive disorders (Varney, Martzke, & Roberts, 1987; Burns, Kappenberg, McKenna, et al, 1994; Fann, Katon, Uomoto, et al, 1995; Alderfer, Arciniegas, & Silver, 2005), anxiety disorders (Panayiotou, Jackson, & Crowe, 2010), and increased emotional

lability (Velikonja, Warriner, & Brum, 2010; Hofer, Holtforth, Frischknecht, & Znoj, 2010) have been associated with TBI in adults and adolescents (Geraldina et al, 2003; Viguier et al, 2001; Kreutzer, Seel, & Gourley, 2001; van Reekum, Cohen, & Wong, 2000). What is less clear is how these changes in emotional state influence the presentation of reactive autonomy, reflective autonomy, and functional independence. Although not yet examined following TBI, one might assume that changes in one's affective state could influence autonomy. For example, an emotionally overwhelmed adolescent with TBI might welcome increased external input from parents to help guide day-to-day functioning. By extension, that protective parent may then be less inclined to supply opportunities for that adolescent to make independent decisions for fear the adolescent might make poor choices or be unable to manage the demands.

Parent Stress.

In addition to relationships with peers, the relationships between adolescents and their parent is likely to be affected both by an adolescent's TBI and the striving towards autonomy. One indicator of the health of the parent/adolescent relationship is the amount of stress the parent feels in the act of parenting their son/daughter (Sheras, Abidin, & Konold, 1998; Zinner, Ball, Stutts, & Philput, 1997). Following their son's/daughter's TBI, parents of adolescents have reported greater overall levels of stress when compared to controls (Benn & McColl, 2004; Hawley et al, 2009; Wade et al, 2003). Sokol, Ferguson, Pitcher, et al (1996) argued that increased levels of stress may impair the parents' ability to adjust to the new demands of their brain injured child. Parenting style can directly influence adolescent independence (Pardeck & Pardeck, 1990). It follows therefore that increased stress levels, which can modify parenting style, are bound to

influence both the adolescent's development of autonomy and their experience of autonomy. Therefore, in this initial investigation of adolescent autonomy post TBI, parenting stress levels will be assessed.

Purpose of Study

Currently, the impact of adolescent TBI on the psychosocial construct of autonomy is not well known. While it is fair to assume that common disruptive consequences of adolescent TBI such as deficits in cognitive ability, executive dysfunction, impaired affect regulation, and increased levels of stress for caregivers are likely to influence an adolescent's ability to be autonomous, these relationships have yet to be explored. The purpose of this study is to offer a preliminary examination of the impact of TBI on adolescent autonomy, from the perspective of adolescents and their parents.

Three types of autonomy, reflective autonomy, reactive autonomy, and functional independence, will be assessed. As described previously, reflective autonomy refers to an adolescent's capacity to weigh outside inputs while simultaneously considering internal interests and emotions in order to identify a goal or action. Reactive autonomy refers to an adolescent's resistance to external influence on behavior. Functional independence refers to the adolescent's ability to independently meet the physical and cognitive demands of daily living. Self-perceptions of both reflective and reactive autonomy of adolescents with TBI will be compared to those of adolescents with no history of brain injury. Parent ratings of functional independence will be compared between parents of adolescents with TBI and those without TBI.

Overall intelligence of the adolescent participants will be measured to ascertain representativeness of both the TBI and the healthy control group. To ensure adequate ability to comprehend and respond to the self-report measures of autonomy, the adolescents will also undergo a screening of reading ability. The degree of the adolescents' difficulty with day-to-day executive functioning tasks will be assessed via parent report.

Multiple factors can influence an adolescent's response to and recovery from TBI. As this study represents an initial investigation into the interaction between autonomy and TBI, numerous factors known to be sensitive to TBI were assessed to better understand their role in the relationship. For example, an adolescent's emotional functioning is presumed to be related to overall psychological well being and perceptions of autonomy. Because affect is sensitive to TBI, ratings of depressed mood and anxiety were assessed and compared in the adolescent groups. Because parent stress levels are known to increase following TBI and presumed to alter parent and adolescent perceptions of autonomy, these levels were also assessed and compared between the groups.

This preliminary investigation will explore the relationship between adolescent autonomy and TBI and seeks to address a critical void in the literature by comparing internal and external perceptions of three different types of autonomy in adolescents with and without a history of TBI. If an effect of TBI on autonomy is revealed, these results should spur further investigation into this key aspect of adolescent development.

Hypotheses

Preliminary hypotheses.

It was hypothesized that the sample of adolescents with TBI will demonstrate common functional sequelae of TBI. When compared to adolescents with no history of TBI, the TBI adolescent group were expected to demonstrate lower scores on measures of intelligence and reading ability (as measured by the RIAS and WRAT respectively), and more frequent problems with tasks that rely upon executive functioning skills (as measured by parent ratings on the BRIEF).

Primary hypotheses.

It was further hypothesized that compared to adolescents with no history of TBI, adolescents with a history of TBI would report

- 1) lower levels of reflective autonomy (as measured by the ARAS)
- 2) and lower levels of reactive autonomy (as measured by the ACL).

Likewise, parents of adolescents with a history of TBI were expected to report that

- 3) those adolescents had lower levels of functional independence (as measured by the ABAS-II),
- 4) those adolescents experienced more problems with day-to-day executive functioning tasks (as measured by the BRIEF),
- 5) and they themselves experienced greater parenting-related stress (as measured by the SIPA).

Secondary hypotheses.

Given the difficulties associated with TBI recovery, it was hypothesized that adolescents with TBI, in comparison with adolescents with no history of TBI, would report more symptoms of depression (BDI-II) and anxiety (BAI). Furthermore, given the close relationship between psychological well being and autonomy, it was expected that for those adolescents with a history of TBI, lower ratings of autonomy (ARAS, ACL) would be related to higher ratings of depression (BDI-II) and anxiety (BAI) symptoms.

Exploratory analyses.

Because this was a preliminary investigation, the relationships amongst several key variables were also studied. Specifically the relationship between parent ratings of functional independence (ABAS-II) and four other key dependent variables, namely reflective autonomy (ARAS), reactive autonomy (ACL), executive functioning (BRIEF), and parenting-related stress (SIPA), were investigated.

Method

This study uses a correlational design with a cross-sectional sample methodology and includes a number of survey instruments. One purpose of the study was to examine how scores of the measures are distributed across group membership, i.e., TBI vs. no TBI. The following section describes the sample, the procedures used during the data collection process, and the analyses used to test the hypotheses.

Participants

In an effort to compile data from the greatest number of participants, adolescents with and without TBI, along with a corresponding parent, were recruited from both Canada and the United States. Data collection began the summer of 2007 in Victoria, British Columbia, and was completed in the summer of 2009 in Columbia, Missouri. The study omits information delineating participant identity and site of participation.

Adolescents aged 12 to 19, with and without prior histories of brain injury were recruited and included in this study. Potential TBI participants were excluded if they reported co-morbid movement disorder or psychiatric illness. Potential comparison participants were excluded if they reported major chronic health problems such as neurological dysfunction, psychiatric illness and/or physical health problems (e.g., diabetes, cystic fibrosis, cancer). Any potential adolescent participants who were unable to identify and/or produce a parent or caregiver willing to join them in the study were also excluded. Participants were drawn from both urban and rural settings and all participant pairs were native English speakers.

Canadian Sample.

The city of Victoria is situated on the southern tip of Vancouver Island in the farthest southwest region of Canada. Adolescent participants with a history of TBI were identified by a review of prior neuropsychological assessment reports at an outpatient child and adolescent health facility run by the Ministry of Children and Families. Two staff neuropsychologists reviewed records to identify adolescents meeting study criteria. An information letter was sent to the identified parties and their parent(s), inviting participation in the study. Over 300 assessment reports were reviewed with 20 eligible adolescents with TBI identified. Letters were sent to all 20 adolescents, with 3 adolescents responding affirmatively. It is unknown whether the low response rate was due to general lack of interest or logistical issues (i.e., outdated mailing addresses). Phone screening was completed by the principal investigator to ensure a match with study criteria. Willing participants scheduled a session at the University of Victoria with a designated parent to complete the study.

US Sample.

Centrally located, the city of Columbia is home to the University of Missouri Health Sciences Center which provides medical education and a wide range of health services to surrounding communities. Rusk Rehabilitation Hospital and the Thompson Center for Autism and Neurodevelopmental Disorders are part of the University of Missouri Health Sciences center and provide assessment and rehabilitation services to a catchment area which includes most of Missouri and sections of Southern Illinois.

The neuropsychological records of over 1000 previous RRC and Thompson Center patients (dated January 2000 through May 2009) were screened to identify

potential participants. An information letter was sent to the identified parties and their parent(s) inviting them to participate in the study. Follow-up phone calls were made to all identified parties one week later with a verbal invitation to participate in the study. Of the 35 former patients identified as eligible to participate, 27 agreed to participate, 17 successfully completed the study, and 10 either cancelled or did not attend the scheduled appointment. Participants completed the study protocol in a convenient location, usually the participants' homes or designated public location (e.g., community public library).

Demographics

In total, data was collected from seventy-eight adolescent and adult participants. Each of the thirty-nine adolescent participants (age range = 12 – 19) were accompanied by 1 parent participant. From these 39 adolescent participants, twenty were identified through specialty clinics, including both inpatient and outpatient services, to have a history of TBI (10 males, 10 females). As indicated in Table 1, the average age of adolescent participants with TBI was 16.8 years ($SD = 2.05$, Range = 13 – 19) with an average time *at* injury of 14.9 years ($SD = 2.05$, Range = 11 – 17) and average time *since* injury of 2.18 years ($SD = 1.59$, Range = 0.17 – 6.75).

Nineteen comparison participants (11 males, 8 females) were recruited through word of mouth, acquaintances with other participants, or were siblings of TBI participants. Mean age for the comparison group was 14.6 years ($SD = 1.86$, Range = 12 – 17).

Table 1

Gender, Current Age, Age at Injury, Time since Injury, and Injury Severity for Adolescent Groups

	TBI (n = 20)	Comparison (n = 19)
Gender		
Male	10	11
Female	10	8
Current age (years)		
M	16.8	14.6
SD	1.70	1.86
Range	13 – 19	12 – 17
Age at injury (years)		
M	14.9	na
SD	2.05	na
Range	11 – 17	na
Time since injury (years)		
M	2.18	na
SD	1.59	na
Range	0.17 – 6.75	na
Severity of injury		
Mild	1	na
Moderate	1	na
Severe	18	na

Using the TBI classification model cited by Lezak (1995; see Table 2), ratings of injury severity for the adolescents with TBI was determined from parent report of posttraumatic amnesia (PTA) and loss of consciousness (LOC). Glasgow Coma Scale (GCS) scores were unavailable for the majority of participants. Two participants were classified with mild to moderate TBI and eighteen participants were classified as severe TBI. Etiology of injuries included motor vehicle accident (12 participants), fall (5 participants), sport-related injury (2 participants), and electrocution (1 participant).

Table 2

Classification of TBI Severity

TBI Classification	GCS	Length of PTA	Duration of Coma
Mild	13 or greater	60 minutes or less	20 minutes or less
Moderate	9 to 12	1 to 24 hours	less than 6 hours
Severe	less than 9	over 24 hours	over 6 hours

Note: Adapted from *Neuropsychological Assessment* (3rd ed.), (p.173-755) by M. D. Lezak, 1995, New York, Oxford University Press.

Procedure

Upon their arrival, participant pairs were given a description of study procedures and expectations. All adolescents under the age of 18 provided informed assent to participate in the study. All adolescents 18 and older, and all parents, provided informed consent to participate in the study. The adolescent and parent participants were then moved to separate rooms. Parent participants filled out questionnaires on their son/daughter's health history, day-to-day behaviors, and functional independence. Parents also provided ratings of parenting stress related to the adolescent participant. During the same visit, the adolescent participants underwent an evaluation of overall cognitive ability and reading level. Adolescent participants reported on depressive symptoms and anxiety symptoms, as well as completing measures of reflective and reactive autonomies. Finally, participant pairs were reunited for debriefing and monetary compensation was delivered.

Measures

This work represents a study of adolescent autonomy and a preliminary investigation into factors which may influence autonomy following TBI. The factors identified to have a potential impact include intelligence, reading ability, executive functioning, depression, anxiety, and the relationship between the adolescents and parents. To ensure the current sample provides a valid and representative group of adolescents with TBI, overall cognitive ability was assessed with the Reynolds Adult Intellectual Scale (RIAS; Reynolds & Kamphaus, 2003) and reading ability was assessed with the Wide Range Achievement Test – Fourth Edition (WRAT-4; Wilkinson, Robertson, & Gary, 2006).

In order to evaluate autonomy, both adolescent and parent perspectives were taken into consideration. Adolescent impressions of reflective autonomy was assessed using a modified self-report version of the Ryff Psychological Well-Being Scale (Ryff, 1989; see Appendix A for the original and appendix B for the modified version) and adolescent impressions of reactive autonomy was assessed using the self-report Adjectives Checklist (ACL; Gough & Heilbrun, 1983). Parent ratings of functional independence were assessed via the Adaptive Behavior Assessment Scale – Second Edition (ABAS-II; Harrison & Oakland, 2003).

To evaluate higher order cognitive skills likely to influence autonomy, executive functioning was assessed through parent report on the Behavior Rating Inventory of Executive Functioning (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000). To evaluate aspects of emotional higher order cognitive skills likely to influence autonomy, depression and anxiety were assessed by the Beck Depression Inventory – Second

Edition (BDI-II; Beck, Steer & Brown, 1996) and Beck Anxiety Inventory (BAI; Beck & Steer, 1990). To evaluate the relationship between the adolescents and parent and its potential influence on autonomy, parenting stress was assessed using the Stress Index for Parents of Adolescents (SIPA; Sheras, Abidin, & Konold, 1998).

Overall Intellectual Functioning – Reynolds Intellectual Assessment Scale.

The RIAS (Reynolds & Kamphaus, 2003) were administered to adolescent participants to obtain a measure of overall intellectual functioning. The RIAS, which is suitable for individuals aged 3 to 96 years, includes a two-subtest Verbal Intelligence Index (VIX), a two-subtest Nonverbal Intelligence Index (NIX), and a Composite Intelligence Index (CIX, created by combining the VIX and NIX subsets). The VIX assesses verbal intelligence by measuring verbal problem solving and verbal reasoning. The NIX assesses nonverbal intelligence by measuring reasoning and spatial ability using novel situations and stimuli that are predominantly nonverbal. The CIX assesses overall general intelligence (g).

The RIAS indexes correlate between .60 to .78 with the Wechsler Intelligence Scale for Children – Third Edition (WISC-III) Full Scale IQ and .70 and above with the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III) Full Scale IQ. The RIAS verbal intelligence index correlates .73 with the Wechsler Intellectual Achievement Test (WIAT) Composite scores.

Reading Ability - Wide Range Achievement Test – Fourth Edition.

The WRAT 4 (Wilkinson, Robertson, & Gary, 2006) was administered to adolescent participants to assess reading ability and to ensure adequate reading

comprehension skills for subsequent measures. The WRAT 4 measures the basic academic skills of word reading, sentence comprehension, spelling, and math computation. It is suitable for individuals aged 5 to 94 years. The Word Reading subtest measures letter and word decoding while the Sentence Comprehension subtest measures an individual's ability to gain meaning from words and to comprehend ideas and information contained in sentences. When combined, these subtests provide a comprehensive evaluation of reading ability in the form of a Reading Composite Score (Wilkinson, Robertson, & Gary, 2006). The WRAT 4 subtests have demonstrated moderate to high correlations with other achievement tests (WIAT-II, .49 - .92; Woodcock Johnson -III Achievement: .54 - .85) and moderate to moderately high correlations with cognitive ability indexes (WISC-IV Full-scale IQ: .50-.81; Stanford-Binet 5 Full-scale IQ: .67-.78).

Reflective Autonomy – Adolescent Reflective Autonomy Scale.

A modified derivative of the autonomy dimension of the Ryff Psychological Well-Being Scale (Ryff, 1989) was created for the purposes of assessing levels of adolescent reflective autonomy. This was done because a review of the literature revealed no current measure of adolescent reflective autonomy. The measure, referred to here as the Adolescent Reflective Autonomy Scale (ARAS), was derived from the original RPWBS which is used with an adult population. The Ryff Psychological Well-Being Scale is a 54-item self-report questionnaire with six dimensions measuring reflective autonomy (self-governance), environmental mastery, positive relations with others, personal growth, purpose in life, and self-acceptance. In adult samples, Ryff (1989) reported an

alpha coefficient of .86 and a six-week test-retest reliability coefficient of .88 for the autonomy subscale.

Individual items for the ARAS were drawn from the 14 questions of the autonomy scale and underwent situational and linguistic modifications to better reflect the context of an adolescent's everyday life while staying consistent with the original construct. For example, consistent with the Ryff Autonomy scoring system, individual items 2, 3, 5, 7, 9, 12, and 14 were positively scored, whereas individual items 1, 4, 6, 8, 10, 11, and 13 were negatively scored. Raw scores could range from -35 to 35. High scores indicate high reflective autonomy, i.e., the ability to regulate behavior from within; whereas low scores indicate low reflective autonomy, i.e., the tendency to rely upon others' judgments rather than one's own in making important decisions. Because the ARAS was constructed for the purposes of this initial investigation, no reliability or validity data are available for this measure at this time.

Reactive Autonomy – Adjective Checklist.

The ACL (Gough & Heilbrun, 1983) was administered to adolescent participants to assess levels of reactive autonomy. The ACL is a 300-item inventory of self-descriptive adjectives to elicit a self-evaluation of multiple aspects of personality for any age range. The Autonomy subscale consists of 44 adjectives, 29 of which reflect (reactive) autonomy, and 15 are contra-indicative of (reactive) autonomy. While the authors do not identify the ACL as a measure of reactive autonomy, the individual items most closely correspond to Murray's conceptualization of the construct (Koestner & Losier; 1996). The Autonomy subscale is reported to have an internal reliability of .69 and test-retest reliability of .76 over 6-months. Those who score high on this scale are

independent and autonomous, assertive, and indifferent to the feelings of others whereas those who score low on this scale tend to avoid risks and welcome direction from trusted superiors (Gough & Heilbrun, 1983).

Functional Independence – Adaptive Behavior Assessment System II.

The ABAS-II (Harrison & Oakland, 2003) will be administered to parent participants to determine the adolescents' levels of functional independence. The ABAS-II provides an assessment of the adaptive skills appropriate for use with individuals aged birth to 89 years (Harrison & Oakland, 2003). The measure's focus on adaptive skills provides a means to quantify both limitations with functioning and quality of life in the adolescent's everyday environment (Harrison & Oakland, 2003). The ABAS-II provides an evaluation of overall level of functioning (e.g., General Adaptive Composite, GAC) and adaptive skill functioning in 10 distinct areas (e.g., Communication, Community Use, Functional Academics, Home Living, Health and Safety, Leisure, Self-Care, Self-Direction, Social, and Work). Reliability coefficients for the GAC are in the high .90s for all age groups, ranging from .97 to .99. Reliability coefficients for the adaptive domains are in the .90s, ranging from .91 to .98. Average reliability coefficients of the skill areas across age groups are typically in the .90s, ranging from .85 to .97. Inter-rater reliability coefficients range from .83 to .85 on the GAC scores and in the .60s and .70s for the skill areas. Factor analytic, concurrent validity and clinical studies provide strong support for its validity (Harrison & Oakland, 2003). While measures of adaptive behavior typically have been used to assist in the assessment of mental retardation, the ABAS-II's emphasis on adaptive skills, not merely adaptive behavior, makes it suitable for use with all persons

who may exhibit limitations in their functional daily living skills (Harrison & Oakland, 2003).

Executive Functioning – Behavior Rating Inventory of Executive Functioning.

The BRIEF (Gioia, Isquith, Guy, & Kenworthy, 2000) was administered to parent participants to assess self-control and problem-solving skills in adolescent participants. The BRIEF is an 86-item questionnaire used to evaluate the presence of problem behaviors by measuring eight aspects of executive functioning. The BRIEF is designed for use with individuals 5-18 years of age and is suitable for use with a wide spectrum of developmental and acquired neurological conditions (e.g., Reading Disorder, ADHD subtypes, TBI, Tourette's disorder, mental retardation, localized brain lesions, high functioning autism). It has demonstrated high internal consistency (alphas = .80-.98) and test-retest reliability (.82). Convergent validity has been established with other measures of inattention, impulsivity, and learning skills; divergent validity demonstrated against measures of emotional and behavioral functioning; Working Memory and Inhibit scales differentiate among ADHD subtypes (Gioia, et al, 2000).

Parenting Stress – Stress Index for Parents of Adolescents.

The SIPA (Sheras, Abidin, & Konold, 1998) was administered to parent participants to assess the degree of stress in parent-adolescent interactions. The SIPA is an extension of the Parenting Stress Index (PSI) appropriate for parents of adolescents aged 11-19 years. It provides a measure of the relationship of parenting stress to adolescent characteristics, parent characteristics, the quality of the adolescent-parent interactions, and stressful life circumstances. Internal consistency is high (.80s-.90), and

alpha coefficients for the three SIPA domains (adolescent, parent, adolescent-parent relationship), and the Index of Total Parenting Stress exceed .90. Test-retest reliability coefficients ranged from .74 to .91, suggesting that responses to SIPA responses remain stable over a period of time (Sheras, Abidin, & Konold, 1998).

Depressed Mood – Beck Depression Inventory – Second Edition.

The BDI-II (Beck, Steer & Brown, 1996) will be administered to adolescent participants to quantify levels of depressed mood. The BDI-II is a 21-item self-report instrument intended to assess the existence and severity of symptoms of depression as listed in the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV; 2000). It has a high coefficient alpha (.80), construct validity has been established, and can reliably differentiate depressed from non-depressed patients.

Anxiety – Beck Anxiety Inventory.

The BAI (Beck & Steer, 1990) will be administered to adolescent participants to quantify levels of anxiety. The BAI is a 21-item self-report instrument intended to assess anxiety symptoms minimally shared with depression. Although originally designed for use with the age range of 17 to 80, the measure has been used in peer-reviewed studies with younger adolescents aged 12 and older (Beck & Steer, 1990). The BAI holds high internal consistency with item-total correlations ranging from .30 to .71 (median=.60). The correlations of the BAI with a set of self-report and clinician-rated scales were all significant (Hamilton Anxiety Rating Scale – Revised = .51; Hamilton Rating Scale for Depression – Revised = .25; BDI=.48). Convergent and discriminant validity to

discriminate homogeneous and heterogeneous diagnostic groups were ascertained and confirmed from three studies.

Data Analysis

All data was analyzed via SPSS. A priori hypotheses were assessed using independent samples t-tests to compare the TBI and Comparison groups on demographic variables (age, gender), intelligence (RIAS), reading ability (WRAT-4), reflective autonomy (ARAS), reactive autonomy (ACL), functional independence (ABAS-II), executive functioning (BRIEF), parenting stress (SIPA), depressive (BDI-II) and anxiety (BAI).

Exploratory analyses were conducted by the use of correlations to examine the strength of the relationship between particular variables of interest within the TBI group. Specifically, the following relationships were examined: functional independence (ABAS-II) with four other variables, reactive autonomy (ACL), reflective autonomy (ARAS), executive functioning (BRIEF), and parent stress levels (SIPA). Although only the relationships of these variables are discussed in detail, correlations between all variables were calculated.

Results

Data Screening

Data were initially screened for outliers and the assumptions of parametric tests. Because of the primary interest in group comparisons, data were screened separately according to group. Although not all participants provided responses for every item on every instrument, the omissions were within acceptable limits according to the guidelines provided with each measure. All dependent variables were collected on all participants.

The descriptive statistics of the dependent variables are presented in Appendix E. These statistics and the corresponding distributions were examined graphically to evaluate the assumption of normality for parametric testing. In addition, skewness and kurtosis values were examined for formal significance. These values are shown in Table 3. Skewness and kurtosis statistics were converted to Z scores by dividing the values by their respective standard errors. Z scores were then compared against the null hypothesis of zero under the Z distribution. Given the small sample size, using a relatively liberal criterion of $p < .05$, the criterion value for $Z = \pm 1.96$. Inspection of the skewness and kurtosis Z scores for the TBI group indicated no significant departures from an expected value of zero for any of the variables. For the comparison group, ACL scores showed significant positive skewness and kurtosis. Graphical inspection indicated that this was due to one outlier (ACL score = 78). Removal of this participant from the comparison group resulted in normally distributed scores in terms of both skewness and kurtosis (i.e., Z scores less than 1.96). Therefore, for the ACL between group comparison, results were evaluated with this participant included and

excluded to ensure this data point did not unduly affect group findings. The BDI-II also showed significant deviations from normality in the comparison group, with high skewness and kurtosis values. Again this was due to the presence of extreme outliers, which were two cases with BDI-II scores in the "severe" depression range. Removal of these cases normalized the distribution. BDI-II comparisons between groups were examined both with and without these two cases.

Table 3.
Skewness and Kurtosis Values of Dependent Variables, Provided Separately for the TBI and Comparison Group.

	TBI				Comparison			
	Skewness		Kurtosis		Skewness		Kurtosis	
	Statistic	Z	Statistic	Z	Statistic	Z	Statistic	Z
RIAS	-.044	-.086	.163	.165	-.335	-.639	.115	.113
WRAT4	-.461	-.900	.939	.946	-.336	-.642	-1.066	-1.051
ACL	-.924	-1.804	1.747	1.760	1.043	1.991*	2.993	2.951*
ARAS	-.274	-.534	-.820	-.826	.593	1.133	-.821	-.809
ABAS II	.001	.001	-.774	-.780	-.982	-1.874	.242	.238
BRIEF	.204	.399	-.774	-.780	.578	1.104	-.283	-.279
SIPA	-.186	-.364	-1.569	-1.581	-.355	-.677	-.909	-.896
BDI-II	.271	.528	.849	-.856	2.013	3.843*	3.959	3.903*
BAI	.898	1.753	-.501	-.505	.707	1.349	-.177	-.174

Standard Error Skewness = .512 for TBI group, .524 for Comparison Group

Standard Error Kurtosis = .992 for TBI group, 1.014 for Comparison Group.

* $p < .05$

Data screening for outliers indicated no other extreme values (> 3 Interquartile Range) for either the TBI group or the comparison sample on any of the other variables. There were instances of moderate outliers (> 1.5 Interquartile range) but these were retained due to the small sample.

The assumption of homogeneity of variance was evaluated by examining the Levene homogeneity-of-variance statistics resulting from between group mean comparisons on each of the outcome measures. This statistic was not significant for any of the measures (p values ranged from 0.27 to 0.98) and therefore this assumption was deemed to be upheld. Linearity assumptions between the predictor (group) and the outcome measures were not examined due to the presence of only two levels of the independent variable.

In summary, data met assumptions of parametric testing and thus, despite the small sample size, the use of t tests and Pearson correlation coefficients was deemed acceptable.

Demographics.

As illustrated in Table 4, the groups were reasonably matched for gender $t(1,37) = 0.48, p = .63$ (two-tailed), $d = 0.15$, yet there was an unanticipated difference in age $t(37) = 3.78, p = .001$ (two-tailed), $d = 1.22$. Specifically, the TBI group ($M = 16.8, SD = 1.70$) participants were older than the control group ($M = 14.4, SD = 1.86$) on average. Age was examined as a potential contributing variable to outcome in the analyses of outcome scores that were not inherently age-corrected (i.e., BDI-II, BAI, ACL, and ARAS).

Table 4

Comparison of Gender and Age across Groups

Characteristic	TBI	Comparison	t-statistic (<i>df</i> = 1,37)	p-value	d'
	M (SD)	M (SD)			
Gender (1=M, 2=F)	1.50 (0.51)	1.58 (0.51)	.48	.63	.015
Age (years)	16.8 (1.70)	14.4 (1.86)	3.78	.001	1.22

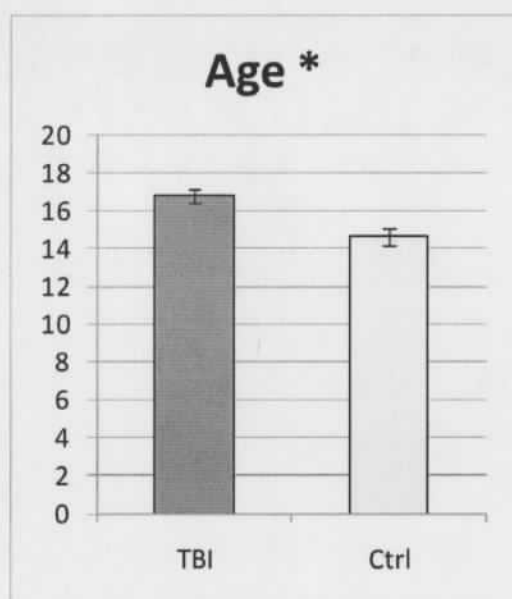


Figure 1. Mean ages of TBI and comparison groups. Error bars represent standard errors of the mean. * $p < .05$

Group performance.

In order to assess the impact of TBI on aspects of 1) cognitive ability, 2) autonomy and functional independence, 3) executive functioning, 4) parenting stress, and 5) adolescent affect, group comparisons were conducted on the sample using independent sample *t*-tests.

Cognitive and Reading Skill Sequelae of TBI.

As indicated in Table 5, adolescents with a history of TBI performed poorer on measures of IQ and reading. The TBI group's performance on a measure of overall intelligence (RIAS) was significantly lower ($M = 89.8$, $SD = 13.31$) than that of the comparison group ($M = 106.4$, $SD = 12.79$), $t(37) = 3.96$, $p = .000$ (two-tailed), $d = 1.27$. This pattern was repeated with the TBI group scoring more poorly on reading ability than did the control group (WRAT4; TBI group – $M = 88.0$, $SD = 14.62$; comparison group – $M = 109.9$, $SD = 10.32$), $t(37) = 5.35$, $p = .00001$ (two-tailed), $d = 1.72$.

Table 5

Comparison of IQ and Reading Ability

Variable	TBI	Comparison	t-statistic ($df = 1,37$)	p-value	d'
	M (SD)	M (SD)			
RIAS	89.8 (13.31)	106.4 (12.79)	3.96	.000	1.27
WRAT4	88.0 (14.62)	109.9 (10.32)	5.35	.000	1.72

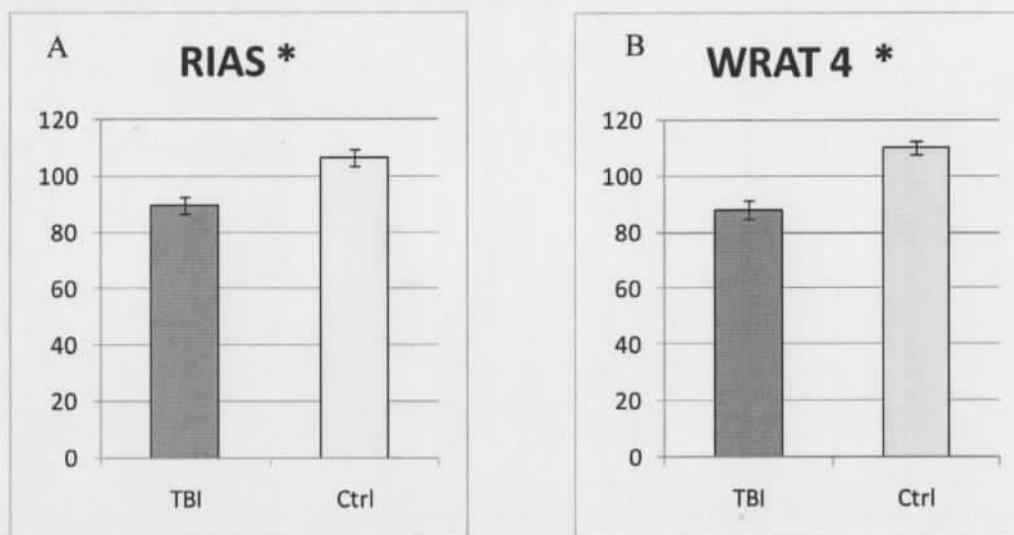


Figure 2. Mean scores for TBI and comparison group on measures of cognitive deficits after brain injury. (A) IQ as measured by the Reynolds Intellectual Assessment Scale (RIAS), (B) Reading ability as measured by the Wide Range Achievement Test 4th Ed. (WRAT-4). Error bars represent standard error of the mean. * $p < .05$

Effect of TBI on Autonomy and Functional Independence.

As indicated in Table 6, there was evidence for an effect of TBI on autonomy and functional independence. Two distinct aspects of autonomy, reflective and reactive, and the related construct of functional independence were assessed in this study. Adolescent self-report was gathered on measures of reflective autonomy (ARAS) and reactive autonomy (ACL), whereas parent-report was used to assess functional independence (ABAS-II).

As indicated in Table 6, the adolescents with TBI reported lower ratings of reflective autonomy but not reactive autonomy. Consistent with study hypotheses, the

TBI group ($M = 7.9$, $SD = 8.33$) rated their level of reflective autonomy (ARAS) as significantly lower than that of the comparison group ($M = 14.8$, $SD = 9.96$), $t(37) = 2.35$, $p = .024$ (two-tailed), $d = 0.76$. Contrary to study predictions however, no significant difference in reactive autonomy (ACL) was found between the two groups (TBI Group, $M = 53.2$, $SD = 7.05$; comparison groups, $M = 54.3$, $SD = 8.41$), $t(37) = .45$, $p = .657$ (two-tailed), $d = 0.14$. Inspection of group differences upon removal of the one extreme outlier in the comparison group did not alter the findings for ACL ($t(36) = .09$, $p = .927$).

In sum, adolescents with TBI in this study reported lower reflective autonomy than did comparison participants. That is, they felt they were less in control of their choices and actions. In contrast, adolescents with TBI did not report lower reactive autonomy. That is, they did not view themselves as more susceptible to external influence.

Table 6

Comparison of Adolescent Ratings of Autonomy and Parent Ratings of Functional Independence across Groups

Variable	TBI	Comparison	t-statistic ($df = 1,37$)	p-value	d'
	M (SD)	M (SD)			
ARAS	7.9 (8.33)	14.8 (9.96)	2.35	.024	0.76
ACL	53.2 (7.05)	54.3 (8.41)	.45	.657	0.14
ABAS-II	89.3 (15.31)	106.3 (12.57)	3.69	.001	1.18

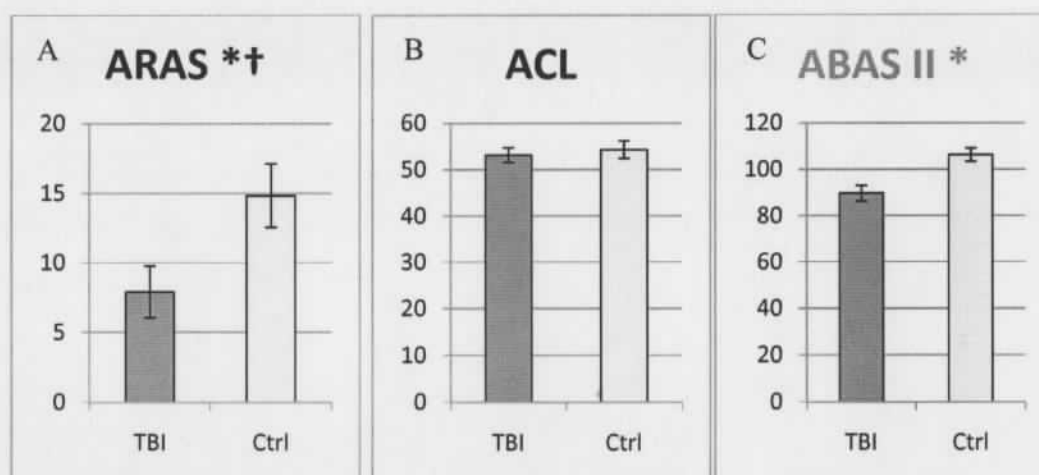


Figure 3. Mean scores for TBI and comparison groups on measures of self-report and parent-report autonomy. (A) Reflective autonomy as measured by the Adolescent Reactive Attachment Scale (ARAS), (B) reactive autonomy as measured by the Adjective Checklist (ACL), (C) and functional independence as measured by the Adaptive Behavior Assessment Scale – Second Edition (ABAS-II). Red font indicates this was parent report. Error bars represent standard error of means. * $p < .05$, † $p = .07$ after adjustment for age.

Also indicated by Table 6, adolescents with TBI, based on the ratings of their parents, appeared less functionally independent than did adolescents with no history of TBI. As predicted, parents of the TBI group ($M = 89.3$, $SD = 15.31$) rated their sons/daughters as having significantly lower levels of functional independence than did the parents of the comparison group ($M = 106.3$, $SD = 12.57$), $t(37) = 3.69$, $p = .001$ (two-tailed), $d = 0.76$. In other words, parents of adolescents with TBI viewed their sons/daughters as less able to independently meet the demands of everyday life.

As scores of the ARAS and the ACL were not normed by age, and given that the TBI and comparison groups had significantly different ages, further analyses were conducted to evaluate possible age differences as a contributing factor in autonomy scores. Two separate one-way between-groups analyses of covariance (ANCOVAs) were conducted to compare 1) the effect of TBI on levels of reflective autonomy, and 2) the effect of TBI on levels of reactive autonomy. The independent variable for each analysis was group membership (i.e., TBI or comparison), and the dependent variables were scores on the ARAS and ACL, respectively. The adolescent participants' age was used as the covariate in both analyses.

Data presented in Table 7 reveals that once the variance associated with age was accounted for, the pattern of the relationships between TBI group and autonomy was marginally changed. Group differences for reactive autonomy remained non-significant after accounting for the variance associated with age, $F(1, 36) = .434, p = .514$, partial eta squared = .012. Group differences remained evident in reflective autonomy after accounting for the variance associated with age, although this relationship was now marginally non-significant, $F(1, 36) = 3.374, p = .074$, partial eta squared = .086. However, it is not clear how to interpret this shift into non-significance, nor the appropriateness of removing the variance associated with age from the analysis of the differences between TBI and comparison groups. The correlation between group and age was found to be .53, the correlation between Group and ARAS was .36 and the correlation between Age and ARAS was -.23. Given the high intercorrelation between age, group and ARAS it is not unexpected for the variance associated with group to have been reduced (leading to the non-significant result), since the age variance has

been removed from both the dependent variable and the group variable. Furthermore there is an associated loss of a degree of freedom. It should be noted that the partial eta squared values for the overall ANOVA model predicting ARAS scores from both age and group (partial eta squared = .133) was not significantly higher than in the model that only included group as a predictor (partial eta squared = .131). Given that the difference between the ARAS scores could have been due to either age or the effect of TBI (i.e., because age and group membership were confounded), then it is unclear whether to attribute the difference to either age or TBI. Given the evidence that reflective autonomy does not vary with age, it seems more reasonable to use scores not corrected for age, and to attribute the difference between the groups to the effects of TBI.

Table 7

ANCOVA: Measures of Autonomy

Variable	ARAS				ACL			
	<i>F</i>	<i>df</i>	<i>p</i>	η^2	<i>F</i>	<i>df</i>	<i>p</i>	η^2
Age	.075	1,36	.786	.002	.282	1,36	.599	.008
Group	3.374	1,36	.074	.086	.434	1,36	.514	.012

Behavioral Consequences of TBI.

As indicated in Table 8, there was evidence for a relationship between of TBI group membership and parent ratings of executive dysfunction. The parent ratings of problems related to executive functioning skills for the adolescents with TBI ($M = 62.2$,

SD = 11.3) were significantly higher than were the ratings from the parents of adolescents with no history of TBI ($M = 52.1$, $SD = 11.67$), $t(37) = 2.74$, $p = .009$ (two-tailed), $d = 0.88$. In other words, parents of adolescents with TBI believed their sons/daughters faced more challenges with everyday tasks that required skills like problem solving, organization, and initiation.

Table 8 also indicates that, contrary to study expectations, TBI did not appear to be related to levels of parenting stress. Ratings of parenting related stress (as measured by parent report on the SIPA) for the TBI group ($M = 58.5$, $SD = 30.61$) did not vary significantly from the comparison group ($M = 45.4$, $SD = 27.71$), $t(37) = 1.40$, $p = .170$ (two-tailed), $d = 0.45$. However, inspection of the descriptive statistics indicated that the mean scores were in the expected direction, that is; the mean scores for the TBI group were higher than in the comparison group. The very large standard deviations in both groups indicate wide variability, which makes it more difficult to obtain significant group differences. Based on the significance testing, parenting an adolescent with TBI appeared to be no more stressful than parenting an adolescent with no history of TBI in this sample.

Table 8

Comparison of Parent Ratings of Executive Dysfunction and Parenting Stress across Groups

Parent Measures	TBI	Comparison	t-statistic (<i>df</i> = 1,37)	p-value	d'
	M (SD)	M (SD)			
BRIEF	62.2 (11.3)	52.1 (11.67)	2.74	.009	0.88
SIPA	58.5 (30.61)	45.4 (27.71)	1.40	.170	0.45

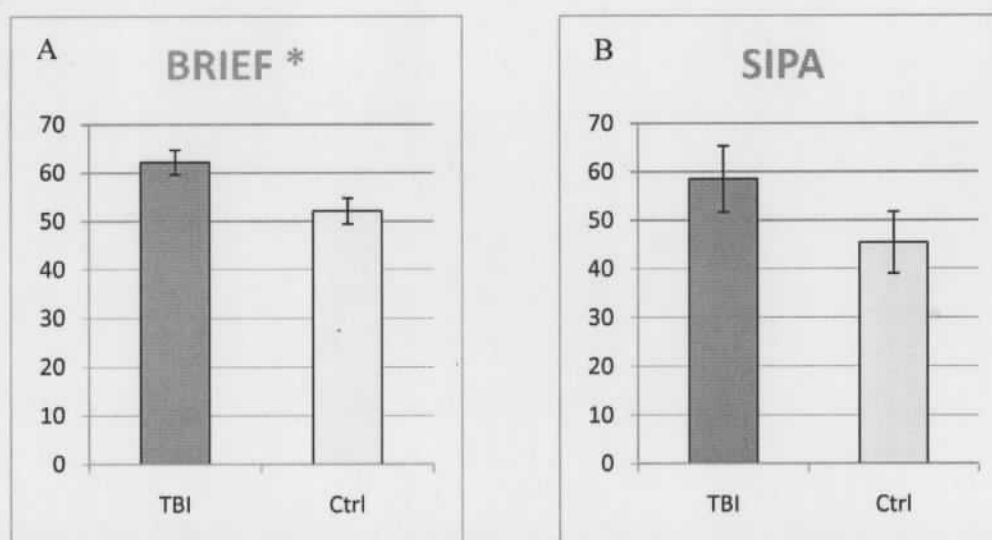


Figure 4. Means for TBI and comparison groups on measures of parent-report executive functioning and parenting stress levels. (A) Executive functioning as measured by the Behavior Rating Inventory of Executive Functioning (BRIEF), (B) parenting stress levels as measured by the Stress Index for Parents of Adolescents (SIPA). Red font indicates this was parent report. Error bars represent standard errors of means. * $p < .05$

Measures of Adolescent Affect.

As indicated in Table 9, no evidence was found for an impact of TBI on either depression or anxiety. The level of self-reported depressive symptoms (BDI-II) for the TBI group ($M = 10.5$, $SD = 7.34$) were not significantly different, $t(37) = .08$, $p = .937$ (two-tailed), $d = 0.03$, from the comparison group ($M = 10.7$, $SD = 10.61$). Group differences were not significant even when the two very high-scoring outliers in the comparison group were removed ($t(35) = 1.50$, $p = .143$). Likewise, the level of self-reported symptoms of anxiety (BAI) for the TBI group ($M = 7.9$, $SD = 6.89$) was not significantly different, $t(37) = .60$, $p = .555$ (two-tailed), $d = 0.19$, from the ratings of the comparison group ($M = 9.2$, $SD = 6.86$). In other words, contrary to study expectations, a history of TBI was not associated with increased problems with depression or anxiety for these adolescents.

Table 9

Comparison of Adolescent Rated Depressive and Anxious Symptoms across Groups

Adolescent Measures	TBI	Comparison	t-statistic ($df = 1,37$)	p-value
	M (SD)	M (SD)		
BDI-II	10.5 (7.34)	10.7 (10.61)	.08	.937
BAI	7.9 (6.89)	9.2 (6.86)	.60	.555

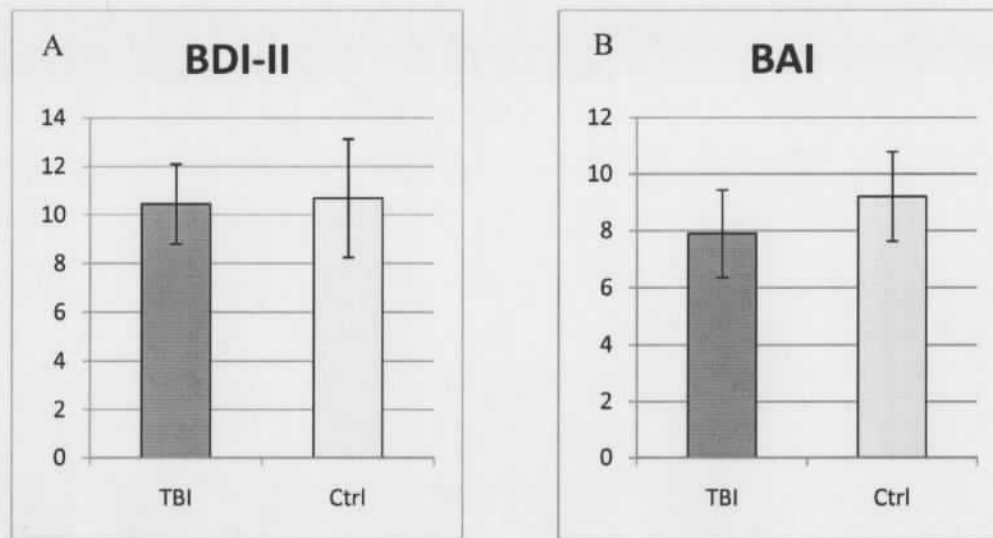


Figure 5. Mean scores for TBI and comparison groups on measures of adolescent self-report levels of depression and anxiety. (A) Depressive symptoms as measured by the Beck Depression Inventory – 2nd Edition (BDI-II), (B) anxiety symptoms as measured by the Beck Anxiety Inventory (BAI). Error bars represent standard errors of means..

As noted previously, the BDI-II and the BAI were two of the measures in this study not automatically normed by age. Given that a significant effect for age was found between the TBI and comparison groups, two separate one-way between-groups analyses of covariance (ANCOVAs) were conducted to compare differences between TBI and non TBI groups on 1) levels of depressive symptoms, and 2) levels of anxiety symptoms. The independent variable for each analysis was group membership (TBI or comparison), and the dependent variables were scores on the BDI-II and BAI, respectively. The adolescent participants' age was used as the covariate in both analyses. Table 10 provides a summary of these ANCOVA analyses.

After adjusting for age, the overall results remained the same. Controlling for age did not impact the levels of depressive symptoms reported, $F(1, 36) = .244$, $p = .624$, partial eta squared = .007, or the levels of anxiety symptoms reported, $F(1, 36) = 1.861$, $p = .181$, partial eta squared = .049, between the two groups. There was also no indication of strong relationships between age and the two affect variables, as indicated by low partial eta squared values in each instance.

Table 10

ANCOVA: Measures of Adolescent Rated Depressive and Anxious Symptoms

Variable	BDI-II				BAI			
	<i>F</i>	<i>df</i>	<i>p</i>	η^2	<i>F</i>	<i>df</i>	<i>p</i>	η^2
Age	.647	1,36	.427	.018	2.57	1,36	.118	.067
Group	.244	1,36	.624	.007	1.861	1,36	.181	.049

Summary of Group Comparisons

In summary, when evaluating the differences between groups, adolescents with TBI performed poorer on measures of overall cognitive ability and reading, and rated themselves as having lower levels of reflective autonomy than did the group of adolescents without history of TBI. Ratings of reactive autonomy did not differ between the groups. The parents of adolescents with TBI rated their sons/daughters as having lower levels of functional independence and executive functioning when compared to the parent-ratings of non brain-injured adolescents. No significant group

differences were revealed with regards to adolescent self-ratings of affect, nor with parent ratings of parent-related stress.

Relationships among variables.

As the focus of this study was to investigate the presence of a commonality of TBI effects on autonomy, this section focuses on the examination of relationships between autonomy and study variables (i.e., age, cognitive ability, executive dysfunction, parenting stress, and adolescent affect) within the TBI group. The data for these analyses can be found in Table 11.

Although relationships were also investigated between autonomy and study variables within the comparison group, and again between autonomy and study variables within the entire sample, those results are not discussed here. The data for these analyses can be found in Tables 12 and 13.

Autonomy and Functional Independence.

Contrary to expectations, the two measures of self-reported autonomy were not related to one another ($r = -0.11, p = .63$; see Table 11). In addition, reactive autonomy was unrelated to the parent ratings of functional independence (ACL & ABAS-II: $r = -.07, p = .78$). Despite a medium-sized correlation coefficient, reflective autonomy was also not significantly related to parent-rated functional independence in the TBI sample (ARAS & ABAS-II: $r = .36, p = .12$)

Autonomy and Intelligence.

As indicated in Table 11, overall cognitive ability in the TBI group was not associated with self-ratings of autonomy, however there was a positive relationship established between IQ and parent ratings of functional independence. Specifically,

adolescent self-report measures of both reflective autonomy (ARAS; $r = -.12, p = .60$) and reactive autonomy (ACL; $r = .04, p = .86$) demonstrated no correlation with overall intelligence, whereas the relationship between IQ and parent-ratings of functional independence (ABAS-II; $r = .57, p = .0085$) was positively correlated. In other words, the higher the adolescent's IQ, the more likely their parents viewed them as able to independently handle the day-to-day demands of everyday life.

Autonomy and Behavior.

As hypothesized, a strong relationship was observed between parent ratings of increased problem behaviors and parent ratings of decreased autonomy. Table 11 reveals the BRIEF scores were negatively correlated with ratings of functional independence on the ABAS-II ($r = -.55, p < .05$). This same measure of executive dysfunction and problem behavior did not, however, correlate as expected with ratings of parent stress ($r = .28, p = .23$).

Autonomy and Affect.

Contrary to expectations, the TBI group's self-perceptions of affect did not appear to have a significant relationship with their self-perceptions of autonomy. Ratings of depressive symptoms did not correlate with either reactive autonomy (ACL: $r = .03, p = .90$) or reflective autonomy (ARAS: $r = .16, p = .50$, see Table 10). Likewise, ratings of anxiety symptoms also failed to demonstrate a significant relationship with either form of self-reported autonomy (ACL: $r = -.06, p = .81$; ARAS: $r = .01, p = .98$, see Table 10).

Table 11
Correlations (*r*) between Study Variables for the TBI Group

	1	2	3	4	5	6	7	8	9
1 AGE	1								
2 RIAS	.28	1							
3 WRAT4	-.25	.43	1						
4 BDI-II	-.22	-.11	.08	1					
5 BAI	.04	.12	.19	.58**	1				
6 ACL	.15	.04	-.08	.03	-.06	1			
7 ARAS	-.18	-.12	.40	.16	.01	-.11	1		
8 ABAS-II	.16	.57**	.62**	.11	.17	-.07	.36	1	
9 BRIEF	-.55**	-.53*	-.19	.19	.12	-.16	.07	-.55**	1
10 SIPA	-.02	-.20	-.29	-.02	-.22	-.34	-.02	-.25	.28

n = 20, *df* = 19

* *p* < .05, ** *p* < .01

Table 12
Correlations (*r*) between Study Variables for the non-TBI Group

	1	2	3	4	5	6	7	8	9
1 AGE	1								
2 RIAS	.15	1							
3 WRAT4	.02	-.55**	1						
4 BDI-II	.37	-.09	.00	1					
5 BAI	.47*	.15	.23	.55*	1				
6 ACL	.04	-.09	-.07	.65**	.17	1			
7 ARAS	.06	.02	.20	.21	-.05	.38	1		
8 ABAS-II	-.23	.43	.60**	-.03	-.06	.14	.29	1	
9 BRIEF	.22	-.31	-.23	.10	.31	-.13	.01	-.62**	1
10 SIPA	.37	-.01	-.25	.49	.30	.02	-.10	-.42	.52*

n = 19, *df* = 18

* *p* < .05, ** *p* < .01

Table 13
Correlations (r) between Study Variables for Total Sample

	1	2	3	4	5	6	7	8	9
1 AGE	1								
2 RIAS	-.14	1							
3 WRAT4	-.44**	.66**	1						
4 BDI-II	.11	.01	.04	1					
5 BAI	.17	.16	.22	.55**	1				
6 ACL	.04	.02	-.01	.41**	.07	1			
7 ARAS	.23	.16	.45**	.18	.01	.19	1		
8 ABAS-II	-.29	.65**	.74**	.04	.11	-.07	.44**	1	
9 BRIEF	.10	-.55**	-.41	.12	.16	-.16	-.12	-.66**	1
10 SIPA	.26	-.21	-.35	-.25	-.01	-.17	-.14	-.38*	.44**

n = 39, df = 38

* $p < .05$, ** $p < .01$

In summary, directional relationships were established as expected in terms of a negative correlation between problems with executive functioning and functional independence. However, contrary to the hypotheses offered, neither a positive correlation between IQ and adolescent-report of autonomy, a positive correlation between affect and adolescent-report of autonomy, nor a positive correlation between adolescent problem behaviors and parent stress were supported statistically in these analyses. Furthermore, the expected positive correlations between the measures of autonomy and functional independence were not supported.

Type I versus Type II Error.

Comparisons were conducted on a large number of dependent variables. Thus, it must be acknowledged that there is an increased experiment-wise risk of Type I error in the formal hypothesis tests. In other words, it is possible that some of the group differences or relationships between variables are spurious and due to chance. However, this research is best conceptualized as an initial exploratory study to guide further investigation. Thus, the researcher was more interested in characterizing potential relationships, at the risk of increased false positives, than in a conservative decision-making approach that minimizes false negatives. In addition, there is an inherent increased possibility of Type II error in this study due to the relatively small sample size and resultant low power to detect differences. The researcher opted to weigh these factors by using a constant alpha of .05 for significance testing, not adjusting for experiment-wise error, while also inspecting the effect sizes and trends in the data, to identify possible relationships of interest. These findings are necessarily preliminary and will require replication in future investigations.

Discussion

The main purpose of this study was to evaluate the relationship between TBI and adolescent autonomy. In order to accomplish this task, an important preliminary step was to first ascertain whether the current sample of adolescents with TBI displayed a pattern of abilities and behaviors somewhat consistent with what is commonly observed in the larger adolescent TBI population. This goal was accomplished, and this sample was shown to be representative of other adolescents with TBI. According to RIAS and WRAT-4 results, the TBI group displayed lower overall cognitive functioning and reading ability when compared to adolescents with no history of brain injury. Parent ratings on the BRIEF likewise indicated that the adolescents with TBI had greater difficulty with everyday tasks of executive functioning.

Regarding the primary goal of evaluating the relationship between TBI and adolescent autonomy, the results were less straight forward. Contrary to expectations, there were no clear differences between the TBI and comparison groups in terms of self perceptions of reactive autonomy (via the ACL). Consistent with expectations however, the TBI adolescent group rated themselves as having significantly lower levels of reflective autonomy (via the ARAS). As noted in the Results, it does not seem reasonable to correct the ARAS scores for age, because age and group membership were confounded, and age is not normally considered to influence reflective autonomy. The TBI group also received lower parent-ratings of functional independence (via the ABAS-II) which were not correlated with the adolescent ratings of either reflective or reactive autonomy.

As previously noted, parent ratings of deficits in everyday executive functioning (via the BRIEF) were consistent with study expectations; adolescents with history of TBI experienced more day-to-day difficulties than did adolescent with no history of TBI. Also consistent with study predictions, a strong negative relationship was observed between parent ratings on the BRIEF and the ABAS-II. In other words, the more problems parents perceived in an adolescents' ability to successfully complete tasks of organization and problem solving, the more problems parents perceived in an adolescents' ability to independently manage the demands of everyday life.

In contrast to study expectations, parents of adolescents with TBI did not report higher levels of parenting stress (as measured by the SIPA) than did parents of non-brain injured adolescents. There was also no evidence to suggest a relationship between parent stress (SIPA) and ratings of either functional independence (ABAS-II) or executive dysfunction (BRIEF).

Finally, this study found no evidence to suggest a relationship between emotional distress and autonomy after TBI. There was no statistically significant difference between the TBI and comparison group in adolescent reported levels of depression (via the BDI-II) or anxiety (via the BAI). Furthermore, self-report ratings of emotional distress were not correlated with self-report ratings of reflective and reactive autonomy for the TBI group.

Interpretation

The primary focus of this study was on autonomy. It was predicted that compared with healthy peers, adolescents with a history of TBI were expected to report lower levels of both reflective and reactive autonomies. That is, they were expected to view

themselves as *less* capable of effectively reconciling internal and external points of view when deciding on a course of action, and *less* resistant to external influences. The results of this study however, suggest that while this current sample of adolescents with TBI did feel less able to reconcile internal and external points of view, they did not feel significantly less resistant to external influences.

Before these interpretations can be accepted, it is important to consider whether the apparent differences between the two types of autonomy are attributable to differences in the instruments used to measure them. The lack of correlation between reading ability (i.e., WRAT4 Reading Composite) and either the ARAS or ACL indicate the ability to read the items was not a factor in either score. However the lack to difference between the groups on the ACL could have been due to a lack of insight on the part of the adolescents with TBI. Perhaps through immaturity, or impediments wrought by brain injury (or both), the sampled adolescents simply lacked sufficient insight to provide veridical self-reports. That is, they rated themselves as normal, or not having problems in this area, because they were incapable of sufficient self-understanding to note the existence of these problems. To assess the validity of this interpretation, it is useful to examine reports of the parents.

Parents of adolescents with a history of TBI rated their sons' or daughters' functional independence as significantly lower than did the parents of adolescents with no history of TBI. These ratings of decreased functional independence were consistent with study expectations and TBI outcome literature (Stancin et al, 2002; Taylor et al, 2002). However, some might wonder if the parents' ratings reflect an underestimate of true ability related to being abnormally attuned to their children's daily functioning given the

long-term recovery period these parents have undergone. If this were the case however, it is reasonable to assume this heightened level of concern would be reflected in greater levels of parenting stress for the TBI group. More likely, this significant group difference reflects a combination of both of these factors. That is, a problem did exist in the past and those parents were quite vigilant as to their sons'/daughters' level of functioning both then and now.

Parent ratings for the adolescents with TBI in this sample suggested more frequent difficulties with everyday tasks dependent upon executive functioning skills. This finding, which is consistent with the literature (Anderson, Damasio, Tranel, & Damasio, 2000) and consistent with study predictions, suggests that adolescents who have experienced a TBI are more likely to have difficulty with planning, organizing, initiation, and problem solving in their everyday life. Ratings of higher executive dysfunction in the TBI group were also closely related to parent perceptions of adolescent functional independence. That is, parents who rated their son/daughter as having significant difficulty with day-to-day executive functioning tasks also perceived them as less capable of managing the demands of everyday life without assistance. It is believed these measures are so strongly linked because they tap into the same observable construct, the adolescent's ability to act independently.

Other stated objectives for this study were to examine the effects of adolescent TBI on parenting stress and to investigate the relationship between parenting stress and either the parent's perception of the adolescent's autonomy or the adolescent's self-perceptions autonomy. Contrary to study expectations, yet very fortunate for the parents of adolescents with a history of TBI, the presence or absence of TBI did not appear to

impact the level of parenting stress experienced by these groups. There was no evidence to support the idea that the adolescents' increased difficulties with executive functioning tasks or their lower levels of functional independence were related to the level of stress experienced by parents of TBI adolescents. The most likely explanation for this positive outcome is that parents of adolescents with a history of TBI have developed coping strategies to deal with the stressors they experience. Also it is possible that parenting an adolescent is stressful regardless of the idiosyncrasies and TBI does not add enough of an additional stressor to alter these results. Incidentally, given that little parenting stress was reported, it is not surprising there was no correlation between parenting stress and any of the measures of autonomy.

Another aim of this study was to investigate the role of affect (i.e., observable emotional state) in self-perceptions of adolescent autonomy. As previously noted however, adolescents with TBI in this study did not report greater symptoms of depression or anxiety compared to their non-brain injured counterparts, and so by extension, depressed/anxious adolescents with a history of TBI did not report discrepant views of their autonomy. While these findings would suggest that TBI does not increase depressive or anxious symptoms, a review of the literature (Geraldina et al, 2003; Viguier et al, 2001; Kreutzer, Seel, & Gourley, 2001; van Reekum, Cohen, & Wong, 2000) would suggest an alternative explanation is warranted. In this particular case, it is possible these results reflect a self-selection bias in the sample. Specifically, when initially contacted to participate in this study, adolescents struggling with issues of depressed mood or heightened anxiety would be more likely to decline, thereby leaving a pool of "better adjusted" adolescents with TBI from which to choose. As this was a preliminary study of

the impact of TBI on autonomy however, it is only safe to conclude that affect does not appear to influence self-perceptions of autonomy following TBI.

Theoretical Implications

The small scale and clinical focus of the present investigation precludes any firm conclusions about the theory of autonomy in adolescence in general. The small scale and clinical focus of the present investigation precludes any firm conclusions about the theory of autonomy in adolescence in general. This study had the potential to uncover a relationship between the autonomy (a largely psychological construct) and executive function or functional independence, but did not. This study did find disagreement between parents and adolescents in their perceptions of the adolescents' autonomy. While the finding that adolescents and their parents disagree is certainly not earth shattering news, it may be useful to have this established empirically and it sets the stage for further studies examining construct validity in autonomy: reflective, reactive, cognitive, emotional. It also raises the question of whether "impaired" autonomy is a useful concept similar to how we think of cognitive impairments or other clinical disorders. The present study, with its small sample, and very likely narrow range of emotional function in the TBI sample, was not able to draw conclusions about the relationship between affective state and perceptions of independence. In adults, we know there is evidence that higher levels of autonomy are associated with positive affect (Ryff, 1989).

An issue which arises out of this study is the relationship between autonomy and self awareness. One of the more complex measurement issues is the requirement for a particular level of self-awareness or insight to accurately report on one's own autonomy.

A benign denial of any problems or dissatisfaction with autonomy (i.e., "things are fine") may mask real deficits in independent functioning. This inability to disentangle perceptions of autonomy and self-awareness is a major limitation of the present study. Self-awareness or insight were not measured in this study and would be important variables to examine in an adolescent population in general and certainly an adolescent population with a history of TBI.

Limitations

This preliminary study of autonomy after TBI has several limitations which limit the strength of the conclusions. The most important limitations in this study were the small sample size and the difficulty in measuring autonomy in adolescents. The current sample had 78 participants, including 20 adolescents with TBI and 19 adolescents without TBI. This relatively small sample size limited the power of statistical comparison and may have reduced the number of significant differences seen. That is, there may have been differences between the TBI and comparison groups that were not seen. In addition there may have been relations between variables that were not within the resolution of this study.

There are two other consequences of the limitation in sample size. With a larger sample, more power and a greater number of significant findings, this study might have been able to provide better insight into theories of autonomy as well as more and better advice to practitioners. In addition, because only 19 adolescents with TBI were studied, it is not clear how representative this sample could be of the population as a whole.

Every case of TBI is different and this makes it difficult to generalize to this population. The level of severity depends on a number of factors (including etiology of

the injury, individual anatomical differences, and quality of acute medical care) all of which dramatically affect outcomes. The sample tested in the current study was functioning at a relatively high level and may have provided a skewed image of the impact of TBI on autonomy. That is, adolescents with more severe impact may have been less autonomous, less functionally independent, or more affected by depression or anxiety. Furthermore, the period of adolescence itself is highly variable. There are considerable differences between adolescents at different developmental stages (e.g., 13 year-olds vs. 18 year-olds) particularly with respect to how they view themselves in relation to their environment. To make it even more challenging, individual adolescents mature at different rates.

The primary explanation for the small sample size was difficulty in recruitment. Specifically, there were problems with locating appropriate participants, problems enticing them to participate once they were found, and difficulties completing the testing once participation was agreed upon. While the case has been made here that adolescent TBI represents a significant public health hazard, this does not alter the small base rates for adolescent TBI in the larger population (i.e., 180 to 250 out of every 100,000; Adelson & Kochanek, 1998). Identifying appropriate candidates proved to be a major challenge which was compounded by the limited resources available to this study. There was only \$500 dollars available for this study which was stretched to cover materials and participant recruitment. This investigation was conducted as part of a doctoral dissertation, and as a doctoral student, rather than a practicing professional, I had limited access to a patient population of adolescents with TBI. Recruitment was dependent on the efforts of third parties to access suitable participants. The efforts of these third parties

while admirable and appreciated, were conducted in the context of significant clinical duties and responsibilities.

In addition, once I did make contact with individuals who might meet inclusion criteria, getting them to participate proved equally challenging, for several reasons. Unlike the professionals who had worked with them during their recovery, I had no previously established a relationship with the families I contacted. Likewise I did not hold sufficient stature as a professional that might entice participants to expend the amount of effort required to participate. This would entail for example driving X number of miles across town to meet, taking time out of their day, or allowing me in to their home. Recruitment was dependent on an initial phone conversation or, in many cases, just an informational letter. A further difficulty was that many adolescent participants were unreliable once they had agreed to participate. Several of the participant pairs cancelled right before their scheduled appointment, failed to show entirely, or failed to return my calls once an appointment had been made.

The second major limitation of this study was the difficulty in measuring autonomy after TBI in adolescents. Autonomy is a challenging construct to assess. Because it relies on internal perception, it cannot be observed by an external examiner and requires indirect measurement. The two self-perception aspects of autonomy addressed in this study (i.e., reflective autonomy – one's ability to define a goal or action by weighing outside inputs and simultaneously considering internal interests/feelings, and reactive autonomy – one's ability to resist external influence) are challenging constructs to grasp. It is possible these constructs might not be well understood or appreciated by adolescents. The primary means by which to assess their answers and draw conclusions

about their ability to effectively answer the questions posed would be to compare their results to other adolescents their same age. This level of analysis is not yet possible however, given that the modified measure of reflective autonomy used in this study for example, the ARAS, has not yet been validated for use with an adolescent population. It is also unclear to what degree the current results from the adolescent with TBI group's reports on the ARAS compare to their same aged counterparts as the ARAS has also yet to be validated with that population.

Future Directions

Despite the limitations described in the section above, the promising findings of this initial investigation indicate that further investigation is warranted. As with all scientific endeavors, there are several important improvements which could help to overcome these limitations and move our understanding of the interaction between adolescent TBI and autonomy beyond our current conceptualization. Future investigations into this important topic will be well served by increasing the sample size, improving the quality and scope of measurement, and improving upon the study design.

A larger sample of adolescents with a greater range of TBI may better capture the range of dysfunction demonstrated by such an injury. Likewise, an increased range in time since injury might allow for a comparison between the short-term and long-term implications of TBI as they relate to an adolescent's sense of self. Often in the acute stages of recovery, attention is focused on aspects of recover more fundamental to survival and questions of independence and identity development are appropriately pushed to the side. A larger sample might also allow for a better representation of the

variability inherent in adolescence both in the individual adolescent and across age groups.

Future studies examining autonomy in adolescence which focus on reflective autonomy as an aspect of the larger construct might benefit from validation of measures used to assess these self-perceptions such as the Adolescent Reflective Autonomy Scale (ARAS) which was used in the current study. Presently, there are no normative data on the ARAS in either healthy adolescents or in adolescents with a history of TBI or other emotional or medical problems. Although the items from the adult version of the Ryff measure and appear to have been suitably modified for use with adolescents, these changes were not evaluated to determine how well they captured this construct in a younger population.

Measurement of adolescent autonomy might also be improved through the gathering of multiple independent measures of the reflective and reactive autonomy. More refined conceptualizations of autonomy including emotional and cognitive autonomy in brain injured populations may benefit both our understanding of these internal processes as well as the implications for behavioral functioning. Additionally, expanding measurement beyond self-report to include performance during role-play scenarios as well as naturalistic observation in multiple settings (e.g., school, home, extra-curricular, rehabilitation) might improve the ecological validity of the assessment.

In the present study, several variables were assessed by only one reporter (i.e., either the parent or the adolescent). In particular, additional reports by adolescents of their own functional independence and their experiences of every executive dysfunction might expand our understanding of any differences in perception of the adolescent's

abilities. Finally, additional sources of behavioral observations from the other parent, teachers, and peers could help to clarify what is likely a highly complex picture of overall level of functioning.

The present study was a preliminary investigation into the impact of TBI on adolescent autonomy and at the time of writing, is the only study of this type. These initial findings indicated that for one small sample of adolescent with TBI there appeared to be a relationship between TBI and autonomy. In order to generalize these findings to the larger population however, it would likely be beneficial to incorporate a larger sample and adopt a longitudinal design. In particular, use of participants from a pediatric rehabilitation setting would likely increase the access to a broader range of age, medical variables, psychosocial variables, and family characteristics. Additionally, a rehabilitation setting might improve access to patient populations and produce better willingness in and retention of subjects due to families and patients connection to the clinical services. A rehabilitation setting may also increase retention of participants over time which is necessary for longitudinal study design critical to understanding any changes in behavior over time. In particular, evaluating the impact of TBI on adolescent autonomy between acute stages of rehabilitation as compared to later, chronic stages of TBI might be particularly useful for our clinical understanding and development of appropriate interventions across time. Longitudinal studies are essential for understanding the normative changes in autonomy over the course of adolescence.

Clinical Implications

This study suggests that autonomy is an important aspect of adolescent functioning that should be addressed by clinicians in a rehabilitation setting as well as

researchers striving to understand the vast implications of brain injury on development. As suggested in the current study, it is possible that differences in perceptions of autonomy may exist between healthy adolescents and those with a history of brain injury. Clinicians may be able to improve their interventions by being aware of variability in autonomy and how it might impact both psychological interventions and rehabilitation more broadly. Rapport between clinicians and patients may be strengthened by accurately reflecting the differences between parents and their adolescent's perceptions (Zinner et al, 1997). That is, adolescents with TBI likely perceive themselves to be independent whereas their parents are very likely to have concerns about their child's ability to function independently.

Understanding differences in perceived level of autonomy may also contribute to a more useful case conceptualization when the clinical focus is on the parent-child relationship and overall family functioning. Specifically, parents may be inaccurate in their assessment of their child's abilities through either over-estimating or under-estimating the child's ability to be functionally independent. Overestimates of ability may lead parents to permit their adolescents to enter situations for which they are underprepared or inadequately supported so as to incur risk to their health and well-being. Underestimates of their child's ability could lead to withholding of opportunities for developmentally appropriate levels of independence. Given that parents have a huge influence over their child's environment, the adolescent's sense of autonomy established through contextual experimentation with their own abilities could be greatly affected. One part of the clinician's work should be to help all members of the family gain more accurate perceptions of how a TBI impacts the adolescent's sense of autonomy and how

to effectively support development of autonomy even when there is significant cognitive impairment. Those adolescents with TBI who take a more active role in treatment are likely to gain more from any rehabilitation program (Prigatano, 2008). Clinically, adolescents with TBI are likely to need guidance on how to be most effective in their own recovery and rehabilitation, developing a healthy sense of autonomy through realistic, developmentally appropriate skill building opportunities.

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6. Was s/he hospitalized after his/her brain injury? Y / N

If yes, for how long? _____

7. Was his/her injury within the past year? Y / N

If yes, how long has s/he been out of the hospital? _____

8. Did s/he lose consciousness or was s/he in a coma after his/her brain injury? Y / N

If yes, for how long? _____

9. After brain injuries, many people have large gaps in their memory. For example, they may have a period of a day, a week, or a month where they don't remember things that happen, things they've done or visitors they've had. Did s/he have any gaps like that? Y / N

{If yes} When did s/he stop having these gaps? (How long after his/her brain injury?)

NOTE: try to estimate how long his/her memory gap was after his/her brain injury (PTA)

and circle one of the following:

*10 minutes
or less*

*An hour
or less*

*A day
or less*

*A week
or less*

1-2 weeks

*A month
or more*

10. Is s/he currently receiving **any rehabilitation** services to help him/her recover from the injury? (For example, physiotherapy, occupational therapy, or psychotherapy). Y / N *{If yes}* About how many hours / week? *{in total}*

_____ {If known, please record what type of therapy is anticipated

_____. Hours per week? ____}

Appendix B: Adolescent Reflective Autonomy Scale (ARAS)

Circle the number that best describes your present agreement or disagreement with each statement.	Strongly Disagree	Disagree Somewhat	Disagree Slightly	Agree Slightly	Agree Somewhat	Strongly Agree
1. I'm not afraid to say what I think even when other people don't agree.	1	2	3	4	5	6
2. Sometimes I change the way I act or think to be more like those around me.	1	2	3	4	5	6
3. I don't usually make decisions based on what everyone else is doing.	1	2	3	4	5	6
4. I tend to worry about what other people think of me.	1	2	3	4	5	6
5. Being happy with the way that I am is more important than other people liking me.	1	2	3	4	5	6
6. People with strong opinions may impact how I think or act.	1	2	3	4	5	6
7. People don't often talk me into doing things I don't want to.	1	2	3	4	5	6
8. I would rather "fit in" with others than be "on the outside" because of my principles.	1	2	3	4	5	6
9. I'm sure about what I think even if most people don't agree.	1	2	3	4	5	6
10. It's difficult to express what I think on things that people argue about.	1	2	3	4	5	6
11. I often change my mind about decisions if my friends or family disagree with me.	1	2	3	4	5	6
12. Being pressured by other people doesn't change how I act or think.	1	2	3	4	5	6
13. I worry about what other people think about the choices I've made in my life.	1	2	3	4	5	6
14. I judge myself by what I think is important, not by what other people think is important.	1	2	3	4	5	6

Appendix C: Ryff Psychological Well Being Scale - AUTONOMY

Definition: High Scorer: Is self-determining and independent; able to resist social pressures to think and act in certain ways; regulates behavior from within; evaluates self by personal standards.
Low Scorer: Is concerned about the expectations and evaluations of others; relies on judgments of others to make important decisions; conforms to social pressures to think and act in certain ways.

- (-) 1. Sometimes I change the way I act or think to be more like those around me.
- (+) 2. I am not afraid to voice my opinions, even when they are in opposition to the opinions of most people.
- (+) 3. My decisions are not usually influenced by what everyone else is doing.
- (-) 4. I tend to worry about what other people think of me.
- (+) 5. Being happy with myself is more important to me than having others approve of me.
- (-) 6. I tend to be influenced by people with strong opinions.
- (+) 7. People rarely talk me into doing things I don't want to do.
- (-) 8. It is more important to me to "fit in" with others than to stand alone on my principles.
- (+) 9. I have confidence in my opinions, even if they are contrary to the general consensus.
- (-) 10. It's difficult for me to voice my own opinions on controversial matters.
- (-) 11. I often change my mind about decisions if my friends or family disagree.
- (+) 12. I am not the kind of person who gives in to social pressures to think or act in certain ways.
- (-) 13. I am concerned about how other people evaluate the choices I have made in my life.
- (+) 14. I judge myself by what I think is important, not by the values of what others think is important.

(+) indicates positively scored items

(-) indicates negatively scored items

Internal consistency (coefficient alpha) = .83

Correlation with 20-item parent scale = .97

Appendix D: Adjective Checklist (ACL)

Directions: This answer sheet contains a list of 300 adjectives. Please read through them quickly and place a mark beside each one you would consider to be self-descriptive. Do not worry about duplications, contradictions, and so forth. Work quickly and do not spend too much time on any one adjective. Try to be frank, and place a mark beside the adjectives which describe you as you really are, not as you would like to be. Be sure to continue through adjective number 300.

1 ☐ absent-minded	36 ☐ cold	71 ☐ dreamy	106 ☐ hard-headed	141 ☐ lazy
2 ☐ active	37 ☐ commonplace	72 ☐ dull	107 ☐ hard-hearted	142 ☐ leisurely
3 ☐ adaptable	38 ☐ complaining	73 ☐ easygoing	108 ☐ hasty	143 ☐ logical
4 ☐ adventurous	39 ☐ complicated	74 ☐ effeminate	109 ☐ headstrong	144 ☐ loud
5 ☐ affected	40 ☐ conceited	75 ☐ efficient	110 ☐ healthy	145 ☐ loyal
6 ☐ affectionate	41 ☐ confident	76 ☐ egotistical	111 ☐ helpful	146 ☐ mannerly
7 ☐ aggressive	42 ☐ confused	77 ☐ emotional	112 ☐ high-strung	147 ☐ masculine
8 ☐ alert	43 ☐ conscientious	78 ☐ energetic	113 ☐ honest	148 ☐ mature
9 ☐ aloof	44 ☐ conservative	79 ☐ enterprising	114 ☐ hostile	149 ☐ meek
10 ☐ ambitious	45 ☐ considerate	80 ☐ enthusiastic	115 ☐ humorous	150 ☐ methodical
11 ☐ anxious	46 ☐ contented	81 ☐ evasive	116 ☐ hurried	151 ☐ mild
12 ☐ apathetic	47 ☐ conventional	82 ☐ excitable	117 ☐ idealistic	152 ☐ mischievous
13 ☐ appreciative	48 ☐ cool	83 ☐ fair-minded	118 ☐ imaginative	153 ☐ moderate
14 ☐ argumentative	49 ☐ cooperative	84 ☐ fault-finding	119 ☐ immature	154 ☐ modest
15 ☐ arrogant	50 ☐ courageous	85 ☐ fearful	120 ☐ impatient	155 ☐ moody
16 ☐ artistic	51 ☐ cowardly	86 ☐ feminine	121 ☐ impulsive	156 ☐ nagging
17 ☐ assertive	52 ☐ cruel	87 ☐ fickle	122 ☐ independent	157 ☐ natural
18 ☐ attractive	53 ☐ curious	88 ☐ flirtatious	123 ☐ indifferent	158 ☐ nervous
19 ☐ autocratic	54 ☐ cynical	89 ☐ foolish	124 ☐ individualistic	159 ☐ noisy
20 ☐ awkward	55 ☐ daring	90 ☐ forceful	125 ☐ industrious	160 ☐ obliging
21 ☐ bitter	56 ☐ deceitful	91 ☐ farsighted	126 ☐ infantile	161 ☐ obnoxious
22 ☐ blustery	57 ☐ defensive	92 ☐ forgetful	127 ☐ informal	162 ☐ opinionated
23 ☐ boastful	58 ☐ deliberate	93 ☐ forgiving	128 ☐ ingenious	163 ☐ opportunistic
24 ☐ bossy	59 ☐ demanding	94 ☐ formal	129 ☐ inhibited	164 ☐ optimistic
25 ☐ calm	60 ☐ dependable	95 ☐ frank	130 ☐ initiative	165 ☐ organized
26 ☐ capable	61 ☐ dependent	96 ☐ friendly	131 ☐ insightful	166 ☐ original
27 ☐ careless	62 ☐ despondent	97 ☐ frivolous	132 ☐ intelligent	167 ☐ outgoing
28 ☐ cautious	63 ☐ determined	98 ☐ fussy	133 ☐ interests narrow	168 ☐ outspoken
29 ☐ changeable	64 ☐ dignified	99 ☐ generous	134 ☐ interests wide	169 ☐ painstaking
30 ☐ charming	65 ☐ discreet	100 ☐ gentle	135 ☐ intolerant	170 ☐ patient
31 ☐ cheerful	66 ☐ disorderly	101 ☐ gloomy	136 ☐ inventive	171 ☐ peaceable
32 ☐ civilized	67 ☐ dissatisfied	102 ☐ good-looking	137 ☐ irresponsible	172 ☐ peculiar
33 ☐ clear-thinking	68 ☐ distractible	103 ☐ good-natured	138 ☐ irritable	173 ☐ persevering
34 ☐ clever	69 ☐ distrustful	104 ☐ greedy	139 ☐ jolly	174 ☐ persistent
35 ☐ coarse	70 ☐ dominant	105 ☐ handsome	140 ☐ kind	175 ☐ pessimistic

176 ☐ playful	211 ☐ sarcastic	246 ☐ stable	281 ☐ unfriendly
177 ☐ pleasant	212 ☐ self-centered	247 ☐ steady	282 ☐ uninhibited
178 ☐ pleasure-seeking	213 ☐ self-confident	248 ☐ stern	283 ☐ unintelligent
179 ☐ poised	214 ☐ self-controlled	249 ☐ stingy	284 ☐ unkind
180 ☐ polished	215 ☐ self-denying	250 ☐ stolid	285 ☐ unrealistic
181 ☐ practical	216 ☐ self-pitying	251 ☐ strong	286 ☐ unscrupulous
182 ☐ praising	217 ☐ self-punishing	252 ☐ stubborn	287 ☐ unselfish
183 ☐ precise	218 ☐ self-seeking	253 ☐ submissive	288 ☐ unstable
184 ☐ prejudiced	219 ☐ selfish	254 ☐ suggestible	289 ☐ vindictive
185 ☐ preoccupied	220 ☐ sensitive	255 ☐ sulky	290 ☐ versatile
186 ☐ progressive	221 ☐ sentimental	256 ☐ superstitious	291 ☐ warm
187 ☐ prudish	222 ☐ serious	257 ☐ suspicious	292 ☐ wary
188 ☐ quarrelsome	223 ☐ severe	258 ☐ sympathetic	293 ☐ weak
189 ☐ queer	224 ☐ sexy	259 ☐ tactful	294 ☐ whiny
190 ☐ quick	225 ☐ shallow	260 ☐ tactless	295 ☐ wholesome
191 ☐ quiet	226 ☐ sharp-witted	261 ☐ talkative	296 ☐ wise
192 ☐ quitting	227 ☐ shiftless	262 ☐ temperamental	297 ☐ withdrawn
193 ☐ rational	228 ☐ show-off	263 ☐ tense	298 ☐ witty
194 ☐ rattlebrained	229 ☐ shrewd	264 ☐ thankless	299 ☐ worrying
195 ☐ realistic	230 ☐ shy	265 ☐ thorough	300 ☐ zany
196 ☐ reasonable	231 ☐ silent	266 ☐ thoughtful	
197 ☐ rebellious	232 ☐ simple	267 ☐ thrifty	
198 ☐ reckless	233 ☐ sincere	268 ☐ timid	
199 ☐ reflective	234 ☐ slipshod	269 ☐ tolerant	
200 ☐ relaxed	235 ☐ slow	270 ☐ touchy	
201 ☐ reliable	236 ☐ sly	271 ☐ tough	
202 ☐ resentful	237 ☐ smug	272 ☐ trusting	
203 ☐ reserved	238 ☐ snobbish	273 ☐ unaffected	
204 ☐ resourceful	239 ☐ sociable	274 ☐ unambitious	
205 ☐ responsible	240 ☐ soft-hearted	275 ☐ unassuming	
206 ☐ restless	241 ☐ sophisticated	276 ☐ unconventional	
207 ☐ retiring	242 ☐ spendthrift	277 ☐ undependable	
208 ☐ rigid	243 ☐ spineless	278 ☐ understanding	
209 ☐ robust	244 ☐ spontaneous	279 ☐ unemotional	
210 ☐ rude	245 ☐ spunky	280 ☐ unexcitable	

