Published in final edited form as:

Rehabil Psychol. 2011 November ; 56(4): 351–358. doi:10.1037/a0025445.

Parenting Style Is Related to Executive Dysfunction After Brain Injury in Children

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Abstract

Objective—The goal of this study was to examine how parenting style (authoritarian, authoritative, permissive) and family functioning are related to behavioral aspects of executive function following traumatic brain injury (TBI) in young children.

Method—Participants included 75 children with TBI and 97 children with orthopedic injuries (OI), ages 3–7 years at injury. Pre-injury parenting behavior and family functioning were assessed shortly after injury, and postinjury executive functions were assessed using the Behavior Rating Inventory of Executive Functioning (BRIEF; Gioia & Isquith, 2004) at 6, 12, and 18 months postinjury. Mixed model analyses, using pre-injury executive functioning (assessed by the BRIEF at baseline) as a covariate, examined the relationship of parenting style and family characteristics to executive functioning in children with moderate and severe TBI compared to OI.

Results—Among children with moderate TBI, higher levels of authoritarian parenting were associated with greater executive difficulties at 12 and 18 months following injury. Permissive and authoritative parenting styles were not significantly associated with postinjury executive skills. Finally, fewer family resources predicted more executive deficits across all of the groups, regardless of injury type.

Conclusion—These findings provide additional evidence regarding the role of the social and familial environment in emerging behavior problems following childhood TBI.

Keywords

traumatic; parenting; permissive; authoritarian; preschool

Children who sustain traumatic brain injury (TBI) are at risk for adverse neurobehavioral outcomes, including deficits in cognitive, academic, behavioral, and social outcomes (Taylor et al., 2002). To be specific, executive functioning, which involves higher order thinking and emotional and behavioral regulation, is typically compromised in individuals with TBI. Impairments in this skill set manifest as difficulties with adapting to environmental changes, controlling actions and impulses, and planning and sequencing behaviors and events. Multiple factors have been shown to predict cognitive and behavioral outcomes following TBI, and the early social environment, such as family functioning, has clear implications for recovery (Taylor et al., 2002; Wade et al., 2011; Yeates et al., 1997, 2002, 2010). However, the relationship of social environmental factors to behavioral aspects of executive functioning following TBI remains relatively unexplored.

TBI is very common in young children, and research shows that executive skills rapidly develop during the first decade of life (Passler, Isaac, & Hynd, 1985; Welsh, Pennington, & Groisser, 1991). Thus, acquired brain injuries in early childhood may disrupt or interfere with executive functioning development, rendering these children particularly vulnerable to emerging executive deficits as they continue to develop (Ewing-Cobbs, Prasad, Landry, Kramer, & DeLeon, 2004; Garth, Anderson, & Wrennall, 1997; McDonald, Flashman, & Saykin, 2002). Preschoolers in particular, because of the dynamic developmental processes of cognitive and behavioral functioning in early childhood, may be at greater risk for long-term deficits following TBI than those injured later in childhood (Ewing-Cobbs et al., 2004; Garth et al., 1997). As children encounter new developmental stages with age, they are at greater risk for displaying executive functioning deficits.

Executive skills play a critical role in self-regulation of behavioral and emotional functioning (Mateer & Williams, 1991), which are highly sensitive to the environmental context. Real-world demands in the surrounding environment can highlight executive dysfunction, especially after TBI (Gioia & Isquith, 2004). Often, children will exhibit more age-appropriate executive skills in structured, organized settings. For example, research has shown that higher levels of parental limit setting and greater family expressiveness, cohesion, and organization, as well as lower levels of family conflict, are related to greater behavioral regulation and control (Schroeder & Kelley, 2009).

The brain is especially malleable during early development, and the quality of the family context (e.g., stimulation, interaction, level of conflict, parenting behaviors) can influence behavioral development (Arranz, Oliva, Miguel, Olabarreira, & Richards, 2010). In particular, parental input and parent-child interactions shape positive skill development and later development of strong executive processes (Campos, Campos, & Barrett, 1989; Eisenberg et al., 2005; Landry, Miller-Loncar, Smith, & Swank, 2002). Warm, positive parent-child interactions and supportive parenting behaviors have been shown to promote the development of effortful control and subsequently emotion regulation (Eisenberg et al., 2005). Moreover, when parents regulate their children's emerging skills, provide clear and consistent discipline, support autonomous behaviors, and offer stimulating interactions, their children develop better impulse control, working memory, and self-regulatory strategies (Bernier, Carlson, & Whipple, 2010; Gauvain & Rogoff, 1989; Landry et al., 2002). Thus, a

growing body of literature supports the importance of parenting in the development of certain aspects of executive skills, such as behavioral regulation.

Although social environmental factors, including family functioning, have been linked to neurobehavioral outcomes following TBI (Anderson, Northam, Wrennall, & Hendy, 2001; Taylor et al., 1999; Wade et al., 2011; Wade, Taylor, Drotar, Stancin, & Yeates, 1998; Yeates et al., 1997, 2010), relatively few investigations have examined the relationship of social environmental factors to executive functioning. In one of the first studies to provide preliminary support for this association, Nadebaum, Anderson, and Catroppa (2007) found that better pre-injury family functioning (i.e., greater amount of intimacy, a more democratic parenting style, and less conflict) and lesser injury severity were predictive of more positive cognitive aspects of executive functioning following TBI. Notably, pre-injury family factors were predictive of certain cognitive aspects of executive functioning as well as the overall executive functioning outcome score that included a combination of cognitive and behavioral aspects of executive functioning. However, these same family aspects were not predictive of behavioral aspects alone, as measured by the overall score on the Behavior Rating Inventory of Executive Functioning (BRIEF; Gioia & Isquith, 2004).

Several aspects of the family context (e.g., family functioning, the home environment, parenting style) have recently been shown to be important in behavioral functioning following TBI (Wade et al., 2011; Yeates et al., 2010), and these same factors may also be important to the development and improvement of executive functions. In typically developing children, the endorsement of an authoritative parenting style has been associated with higher levels of positive, compliant behaviors, sociability, and the ability to self-regulate emotions and behaviors compared to the use of authoritarian or permissive parenting styles (Baumrind, 1967, 1971; Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987; Ginsburg & Bronstein, 1993; Lamborn, Mounts, Steinber, & Dornbusch, 1991). Specific to TBI, Wade and colleagues (2011) found that warm responsive parenting and the absence of parental negativity resulted in positive child behavioral outcomes following injury. According to the literature, permissive parenting styles can have detrimental effects on a child's behaviors, resulting in greater psychological distress and delinquent behaviors (e.g., substance abuse, school misconduct; Lamborn et al., 1991). Furthermore, Yeates and colleagues (2010) showed that the behavioral effects of TBI are more pronounced in children whose parents reported higher levels of permissive and authoritarian parenting styles.

The primary aim of the current study was to examine the relationship of social environmental factors (i.e., family functioning, stressors and resources, and parenting style) to executive functioning across the initial 18 months following early childhood TBI. Previous studies of the same cohort have examined proximal influences, such as the quality or style of parenting (Wade et al., 2008; Yeates et al., 2010), as well as distal factors, such as socioeconomic status, global family functioning, and caregiver stressors and resources, as predictors of behavioral functioning. Using these same proximal and distal factors to examine behavioral aspects of executive functions, which are at increased risk for impairment in this group, may afford an even greater understanding of social environmental influences on additional factors after pediatric TBI. Based on the developmental psychopathology literature and recent studies on family factors and TBI, we hypothesized that authoritarian and permissive parenting styles would negatively affect executive functions, especially following severe TBI (Dornbusch et al., 1987; Lamborn et al., 1991; Wade et al., 2011; Yeates et al., 2010). We also hypothesized that poorer overall family functioning, greater family stress, and fewer resources would result in greater executive dysfunction, particularly in the context of severe TBI.

Method

Design

This study was a part of an ongoing research project comparing young children with TBI to young children with orthopedic injuries (OI) not involving an insult to the central nervous system (brain or spine). The project used a concurrent cohort, longitudinal research design that involved four repeated assessments. The four assessments included an initial evaluation performed shortly after injury and three follow-up assessments 6 months, 12 months, and 18 months thereafter. At the initial assessment, parents completed retrospective reports regarding the child's behavior and family characteristics prior to the injury. The purpose in recruiting children with OI was to allow for the comparison of TBI sequelae relative to consequences from a nonneurologic injury. The use of an OI group as a comparison group also helped to control for pre-injury risk factors and behaviors, the stress of hospitalization, family background and characteristics, and practice effects from repeated assessment.

Participants

Children in the current study were recruited from four hospitals through screening hospital admissions of children with traumatic injuries. The inclusion criteria for both the TBI and OI groups were: (1) hospitalization for at least one night's duration; (2) age between 3.0 and 6.11 years old at the time of injury; (3) native speakers of English; (4) absence of previous history of brain injury, child abuse, or severe psychiatric disorder requiring hospitalization; (5) no known neurologic disorder (e.g., medical disease affecting the central nervous system [CNS]); and (6) no diagnosis of mental retardation ($IQ < 70$). In addition to overnight hospitalization and closed head injury, criteria for inclusion in the TBI group included a lowest-recorded Glasgow Coma Scale (GCS; Teasdale & Jennett, 1974) score less than 13 or a higher score with abnormalities detected on MRI or computed tomography (CT) scan. The TBI group was classified into two groups based on severity of injury. The severe TBI group was defined by a GCS score of 8 or less, and the moderate TBI group was defined by a GCS score of 9 to 12, or a GCS score higher than 12 with an abnormal MRI or CT scan at the time of injury. Eligibility for the OI group was limited to orthopedic injuries that were not also accompanied by CNS insult.

Participants included 75 children with TBI and 97 children with OI. Comparison of enrolled children to those in the Trauma Registry at participating hospitals meeting age and injury severity criteria indicated that our sample was representative of all eligible children in terms of race and family income (estimated based on median income from the 2005 census for the child's address; <http://www.ffiec.gov/Geocode/default.aspx>). The TBI group consisted of 55 with moderate TBI and 20 with severe TBI. Thirteen children were excluded from the analyses due to missing data from the baseline assessment on one or more of the measures.

The sample characteristics for all children recruited in the current study are presented in Table 1. Overall, the majority of participants were White (73%), and slightly more than half of the children recruited were boys (57%). In general, maternal education level was lower in the TBI group. Across all three groups, census tract income was comparable. The most common sources of injury in the TBI group were motor vehicle accidents and falls. The OI group sustained injuries most frequently from falls in general and specifically playground equipment injuries. Consistent with expectations, the Injury Severity Score (Mayer et al., 1980) was higher in the TBI groups. To control for socioeconomic differences among the groups, race and a composite variable of maternal education and family income based on census tract data were included as covariates in the analyses.

Procedure

All procedures were approved by the institutional review boards at the four participating hospitals. Once children were medically stable, eligible children and their families were approached regarding participation. Following parental consent, background information about the child and family was obtained through interviews and parent-report measures. Parents also completed standardized assessments of children's executive functioning (BRIEF) across four different time points, shortly following hospital discharge (baseline) and at 6, 12, and 18 months postinjury. The ratings obtained at the initial assessment were intended to reflect pre-injury family status and child behavior.

Measures

The Parenting Practices Questionnaire (Revised; Robinson, Mandleco, Olsen, & Hart, 1995) is a 62-item, self-report measure of global parenting practices with demonstrated reliability and validity. The questionnaire generates scores on three main parenting dimensions consistent with Baumrind's (1966) authoritarian, authoritative, and permissive styles. At baseline, parents were asked to complete the questionnaire to reflect pre-injury parenting style.

To assess children's executive functioning skills, caregivers (96% were mothers) completed the BRIEF (Gioia & Isquith, 2004). The BRIEF assesses executive behaviors within the framework of everyday functioning and focuses on two domains of executive function skills, including behavioral regulation (e.g., inhibition, flexibility, emotional control) and metacognition (e.g., planning, organizing, working memory). For children younger than 5.11, the preschool version was given. The two versions are highly similar, using many of the same questions and domains of executive functioning, and each version yields an overall measure of executive functioning, the Global Executive Composite (GEC). The reliability and validity of the BRIEF with normative samples and individuals with TBI have been documented in previous studies (Gioia & Isquith, 2004; McCarthy et al., 2005).

The Family Assessment Device General Functioning scale (FAD–GF; Byles, Byrne, Boyle, & Oxford, 1988; Miller, Bishop, Epstein, & Keitner, 1985) is a self-report measure of family functioning with established reliability and validity. The 12-item general functioning scale was used as an index of family functioning in the current study. Higher scores reflect greater family dysfunction.

The Life Stressors and Social Resources Inventory (LISRES; Moos, Fenn, & Billings, 1988) was used to assess life stressors and social resources as a way of understanding the distal family environment. The LISRES has established reliability and both concurrent and predictive validity (Moos et al., 1988). This interview-based measure assesses family stressors in the domains of health, work, spouse, extended family, and friends. Resources are assessed in the domains of work, spouse, extended family, and friends. Stressor and resource subscales were averaged to create an overall index for each.

Statistical Analyses

We used linear mixed models to test the relationships between parenting style and family functioning and executive functions over time in children with TBI compared to OI. In these analyses, executive functioning across the initial 18-months postinjury was measured using the BRIEF GEC. Pre-injury executive functioning, as assessed at baseline, was included in the model to control for premorbid differences, thereby enabling us to examine changes in executive functioning following injury. Covariates in this study included: premorbid GEC scores, child's race, child's sex, and family's socioeconomic status. We estimated the main effects of each of the covariates. In addition, we examined the main effects as well as all

possible three-way interactions among the following predictors: injury severity (OI, moderate TBI, severe TBI), parenting style (authoritarian, authoritative, and permissive), overall family functioning, family stressors and resources, and linear and quadratic terms for time since injury (years). Higher order interactions that were not significant were eliminated and the models were re-estimated. We used an alpha of .05 to determine significance effects. Finally, we report relevant contrasts among injury group and parenting style.

Results

Correlations Among the Social Environmental Risk Factors and GEC

Table 2 reports the zero-order correlations for the variables of interest. Inspection of zero-order correlations revealed modest correlations among the dimensions of the Parenting Practices Questionnaire (see Table 2). Authoritative parenting correlated negatively with the other two dimensions, permissive ($r = -.17$) and authoritarian ($r = -.44$). Surprisingly, authoritarian parenting style was positively correlated with permissive behaviors ($r = .47$). Correlations between the baseline measures of the social environment and the BRIEF GEC for Visits 2 through 4 were all significant, and ranged from $-.22$ to $.40$ for family functioning, resources, and stressors. As anticipated, positive correlations were found between the BRIEF GEC and family dysfunction and stressors and negative correlations were found between BRIEF GEC and family resources. The correlations between baseline parenting and BRIEF GEC for Visits 2 through 4 ranged from $-.09$ to $.33$ for parenting practices. Permissive and authoritarian parenting styles were significantly associated with greater executive dysfunction.

Descriptive statistics for the variables of interest by group are reported in Table 3. The mean BRIEF GEC scores were highest in the severe TBI group across all time points following injury, and the range of scores was also greatest in this group. Overall stressors and resources as well as family functioning were comparable across groups at baseline. In addition, average levels of authoritative, permissive, and authoritarian parenting styles were also similar across groups at baseline.

Parenting Style and Executive Functioning

Authoritarian parenting moderated the effects of TBI on executive function skills across time, as indicated by a significant Parenting Style $\times$ Group $\times$ Time interaction, $F(2, 142) = 4.36$, $p = .01$. To examine this interaction, authoritarian parenting was arbitrarily separated into low ($z = -1.0$) and high ($z = 1.0$) levels of authoritarian parenting (see Figures 1 and 2). Group contrasts revealed that children with moderate TBI who experienced high levels of authoritarian parenting had significantly higher levels of executive dysfunction than children with OI at 12 ($p = .04$) and 18 ($p = .01$) months postinjury; whereas children with moderate TBI and low levels of authoritarian parenting did not differ from the OI group at any time point. Severe TBI, regardless of the level of authoritarian parenting, was associated with greater executive dysfunction than OI across all time points. Thus, higher levels of authoritarian parenting were associated with greater executive dysfunction following moderate TBI, especially with increasing time postinjury.

The Parenting Style $\times$ Group $\times$ Time interaction for permissive parenting approached significance, again suggesting that parenting moderated the effects of TBI on executive functions across time, $F(2, 138) = 2.75$, $p = .07$. Given the moderate correlation between authoritarian and permissive parenting styles, this trend is not surprising. To examine contrasts, permissive parenting was arbitrarily separated into low ($z = -1.0$) and high ($z = 1.0$) levels of permissive parenting. At high levels of permissive parenting, the trajectory of changes in executive functioning was significantly different in the severe TBI group than the

OI group across all time points ($p < .01$) with greater executive deficits following severe TBI. At low levels of permissive parenting, the severe TBI group showed greater executive difficulties at 12 and 18 months postinjury ($p < .01$) than the OI group but not at 6 months. In the moderate TBI group, greater executive difficulties were apparent at 6 and 12 months ($p < .05$) but not at 18 months at low levels of permissive parenting style. No moderating effects were associated with the authoritative parenting style.

Family Functioning, Stress, and Resources and Executive Functioning

No main effects or interactions were present for overall family functioning or family stressors, suggesting that pre-injury family functioning and stressors did not account for significant variance in executive functions following TBI once socioeconomic and parenting factors have been taken into account. Caregiver resources showed a main effect on executive functioning, $F(1, 168) = -0.33, p = .01$, such that fewer resources predicted more executive deficits across groups. Thus, more family resources were protective in all families, regardless of the type of injury.

Discussion

This study extends a growing literature examining the relationship of the social environment to emerging cognitive and behavioral difficulties following pediatric TBI (Taylor et al., 2002; Wade et al., 2008; Yeates et al., 1997, 2002, 2010) and is among the first to examine parenting style as a predictor of behavioral aspects of executive functions in this population. Findings support the hypothesis that both distal and proximal social environmental factors influence the trajectory of changes in executive functions following TBI. However, the specific nature of the association between these factors and executive skills following TBI only partially supported our hypotheses. To be specific, authoritarian and permissive but not authoritative parenting styles moderated executive behavior outcomes. In addition, greater family resources were associated with positive executive functioning. These findings add to our understanding of executive functioning skills following early TBI and have important implications for intervention.

Parenting Style

Parenting style influenced executive behaviors following moderate TBI, with authoritarian parenting in particular being detrimental for postinjury functioning in this group. Notably, at low levels of authoritarian parenting style, children with moderate TBI and OI were rated as having a similarly low frequency of dysexecutive behaviors. High levels of authoritarian parenting apparently interfere with the exhibition of appropriate executive behaviors and/or exacerbate executive dysfunction. However, the association of authoritarian parenting and executive dysfunction following moderate TBI was only the evident at 12 and 18 months postinjury, and not at 6 months. Parenting style may not be as influential during the first 6 months postinjury because of the rapid rate of neural recovery during this period simply from the process of organic healing. At later time points, when the most rapid recovery of brain function is complete and chronic deficits are identified, authoritarian parenting style shows greater effects on behavior and is detrimental to the demonstration of healthy executive functions. These findings are in line with previous studies linking authoritarian parenting to negative behavioral outcomes in the general population (Calkins, Smith, Gill, & Johnson, 1998; Lamborn et al., 1991) and in children with TBI (Yeates et al., 2010). In Yeates et al. (2010), higher levels of authoritarian parenting were associated with greater behavior problems at 12 and 18 months postinjury as well.

Contrary to our hypotheses, authoritarian parenting was unrelated to executive functioning following severe TBI. The severe TBI group may be less responsive to environmental

influences due to the nature and severity of the injury. Thus, executive functioning was significantly worse in this group when compared to the OI group, regardless of the nature of parental discipline. This is consistent with a previous study that found significantly worse behavioral outcomes in the severe TBI group and less moderating effects of the family environment on behavior across time when the injury was severe (Yeates et al., 2010). To be specific, there are harmful effects on behavioral outcomes following severe TBI, regardless of the family environment.

Permissive parenting tended to moderate the effects of both moderate and severe TBI on executive functions over time; however, the nature of the moderation effect varied. As expected and consistent with previous literature focusing on behavioral outcomes (Chapman et al., 2010; DeVito & Hopkins, 2001; Yeates et al., 2010), permissive parenting was associated with poorer outcomes following TBI; specifically, it was related to deficits in executive functioning in the severe TBI group. Significant emotional and behavioral dysregulation are commonly seen after TBI, and lenient or laissez faire parenting that offers less supervision and lacks regular structure may be particularly harmful for subsequent development of self-regulation and executive skills. However, this association was evident in our study only at the 6-month follow-up and not at the 12 or 18 months follow-ups, suggesting a need to address parenting style in the acute stages of rehabilitation. These findings are consistent with a recent study with the same cohort that also suggested that the deleterious effects of severe TBI may be less influenced by the social environment over time (Yeates et al., 2010).

Permissive parenting did not have the expected effect on executive skills in the moderate TBI group. In fact, children with moderate TBI showed greater executive deficits at low levels of permissive parenting. Because impairments following moderate TBI are likely to be less significant and more short-lived, children with moderate TBI may not need the same level of parenting structure and supervision that is necessary following severe injuries, which often result in ongoing deficits in behavioral, adaptive, and cognitive functioning (Taylor et al., 2002). The current findings may reflect the unique recovery trajectories of brain injury as a function of severity. For example, severe TBI was associated with positive executive functioning outcomes over the course of 2 years, but also with persistent deficits that are not seen in moderate injuries (Anderson & Catroppa, 2005).

The literature on parenting style recommends an authoritative approach for optimal, positive psychosocial development in typically developing children (Baumrind, 1967, 1971; Dornbusch et al., 1987; Ginsburg & Bronstein, 1993; Lamborn et al., 1991). Furthermore, warm and responsive parenting has been associated with decreased behavioral problems following childhood TBI (Wade et al., 2008; 2011). However, authoritative parenting was unrelated to changes in executive functioning in the current study. Previous research has found that authoritative parenting alone did not lessen behavioral problems in young children, pointing to the likely role of other mediating and moderating factors and predictors (DeVito & Hopkins, 2001).

Resources and Family Functioning

Consistent with prior investigations (Taylor et al., 1999; Taylor et al., 2002; Yeates et al., 1997, 2010), we found that family resources were related to executive functioning. In the sample as a whole, greater family resources were associated with better executive functioning. Contrary to our hypotheses and previous findings, family functioning and family stressors were unrelated to changes in executive skills over time. Statistically, family functioning and family stressors may have not been significant because a more proximal predictor (i.e., parenting) was able to explain a larger portion of the variance. Family functioning may also exert its influence on executive functioning through parenting styles,

such that families with poorer family functioning also have parenting styles that exacerbate poor outcomes.

Limitations

Limitations in the current study include a small sample size in the severe TBI group. In addition, uncomplicated mild TBI was not examined in the current study, thus limiting the generalizability of the findings. Furthermore, assessment of child executive functioning and parenting style were based on parent report alone, and shared rater variance may have inflated the correlations among the measures. Using only parent report and not performance-based tests to assess executive functions precludes objective measurement of cognitive, as opposed to behavioral, functions tied to executive functioning. In addition, use of both the preschool and school-age versions of the BRIEF precluded separate examination of the behavioral regulation and metacognitive indices that comprise GEC given the absence of data on the comparability of the Metacognitive Index from the school-age version and the Emergent Metacognition Index from the preschool version (Gioia & Isquith, 2004). Thus, future studies are necessary to shed light on the relationship of parenting and familial factors to cognitive aspects of executive functioning as assessed by neuropsychological tests.

Conclusions

Our findings provide evidence for the influential role of proximal parenting factors, as well as more distal family resources, in executive functioning, especially among children with moderate TBI. Assessing parenting style as well as available resources will aid in the identification of children at risk for increased executive difficulties following TBI. Early interventions focusing on effective parenting practices for families adjusting to recovery from TBI may prove effective in reducing negative child outcomes. One study showed that modifying parenting practices reduced internalizing and externalizing symptoms in a general population (DeGarmo, Patterson, & Forgatch, 2004). In addition, a recent study provided preliminary evidence of the utility of parent skills training following early childhood TBI (Wade, Oberjohn, Burkhardt, & Greenberg, 2009). Thus, our findings may have significant implications for understanding executive skills in young children with TBI and for developing family centered interventions to facilitate positive behavioral outcomes.

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Figure 1.

Behavior Rating Inventory of Executive Functioning Global Executive Composite (BRIEF GEC) scores as a function of group membership at high levels of authoritarian parenting. The moderate traumatic brain injury (TBI) group was significantly different from the orthopedic injuries (OI) group at 12 and 18 months postinjury. The severe TBI group was significantly different from the OI group at all occasions and significantly different from the moderate TBI group at 6 months postinjury.

Figure 2. Behavior Rating Inventory of Executive Functioning Global Executive Composite (BRIEF GEC) scores as a function of group membership at low levels of authoritarian parenting. The severe traumatic brain injury (TBI) group was significantly different from the moderate TBI and orthopedic injury (OI) groups at all occasions.

Table 1

Demographic and Injury Characteristics

	Severe TBI (<i>n</i> = 20)	Moderate TBI (<i>n</i> = 55)	OI group (<i>n</i> = 97)
Characteristic	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Age at injury	5.03 (1.05)	5.01 (1.19)	5.04 (1.08)
Source of injury *			
MVA	50%	22%	7%
Falls	30%	49%	32%
Sports/playground	5%	9%	46%
Other	15%	20%	15%
Non-White (%)	7 (35)	16 (29)	23 (24)
Maternal education *			
<High school graduate	14 (70%)	29 (53%)	42 (43%)
Census income	\$54,117 (16,209)	\$60,235 (24,998)	\$64,993 (23,303)
Child's gender (% boys)	14 (70)	32 (58)	52 (54)
Days of hospitalization *	11.17 (20.28)	2.47 (1.87)	1.33 (1.0)
Injury to baseline (days) *	48.9 (24.5)	39.56 (20.36)	33.91 (14.65)
GCS Score *	3.95 (1.8)	13.44 (2.0)	
ISS *	13.12 (9.3)	14.8 (7.6)	7.0 (2.7)

Note. TBI = traumatic brain injury; OI = orthopedic injuries; Other = bicycle or other recreational transport accident, rough housing, miscellaneous; GCS = Glasgow Coma Scale; ISS = Injury Severity Score.

* Significant group difference, $p < .05$.

Table 2

Zero-Order Correlations of Predictor and Outcome Variables

Variable	GEC	Stress	Resource	FAD-GF	Auth1	Perm	Auth2
GEC	1.00						
Stress	0.36	1.00					
Resource	-0.22	-0.44	1.00				
FAD-GF	0.32	0.40	-0.53	1.00			
Auth1	-0.09	-0.18	0.20	-0.33	1.00		
Perm	0.33	0.32	-0.21	0.33	-0.17	1.00	
Auth2	0.28	0.38	-0.33	0.43	-0.45	0.43	1.00

Note. GEC = Global Executive Composite; Stress = overall stressors; Resource = overall resources; FAD-GF = Family Assessment Device General Functioning scale; Auth1 = authoritative parenting style; Perm = permissive parenting style; Auth2 = authoritarian parenting style.

* All correlations were significant, $p < .01$.

Table 3

Means, Standard Deviations, and Ranges for Predictor and Outcome Variables

	Severe TBI			Moderate TBI			OI		
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range
GEC									
Baseline	54.1	14.4	34 to 90	49.8	12.9	32 to 102	48.8	12.1	32 to 92
6 months	63.1	19.5	32 to 97	52.5	12.9	33 to 89	49.0	10.8	33 to 87
12 months	59.4	15.9	32 to 107	51.7	12.9	32 to 81	47.9	10.0	32 to 81
18 months	62.3	13.7	37 to 102	50.7	11.7	33 to 73	48.1	11.1	33 to 85
Baseline									
Stressors	53.3	7.6	40 to 67.2	51.4	6.1	40.9 to 71.3	50.3	6.0	38.3 to 68.9
Resource	51.9	7.2	39 to 64.3	51.1	6.2	33.0 to 61.2	52.2	5.4	33.5 to 64
FAD–GF	1.7	0.5	1.0 to 2.8	1.6	0.4	1.0 to 2.3	1.5	0.5	1.0 to 3.4
Auth1	–0.3	1.2	–3.6 to 1.0	0.1	0.9	–2.1 to 2.0	0.0	1.0	–3.1 to 1.8
Perm	0.3	1.3	–1.2 to 3.3	–0.1	0.8	–1.8 to 2.1	–0.1	1.0	–1.9 to 3.3
Auth2	0.1	1.1	–1.6 to 2.8	–0.1	0.9	2.1 to 2.5	0.0	1.0	–1.9 to 2.9

Note. TBI = traumatic brain injury; OI = orthopedic injuries; GEC = Global Executive Composite; Stressors = overall stressors; Resource = overall resources; FAD–GF = Family Assessment Device General Functioning scale; Auth1 = authoritative parenting style; Perm = permissive parenting style; Auth2 = Authoritarian parenting style.