# Post-Injury Apathy in Children Who Have Sustained a Traumatic Brain Injury

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## Abstract

Apathy may appear in children following traumatic brain injury (TBI). Children are particularly vulnerable to TBIs; however, limited literature is available concerning apathy in children post-TBI both internationally and in South Africa. In this study we investigated the incidence of post-injury apathy in children with a TBI and whether degree of apathy varies with injury severity. The sample included 18 children who have sustained mild ($n$ = 6), moderate ($n$ = 6) and severe ($n$ = 6) TBIs, as well as 6 typically developing (TD) children ($n$ = 6). The Children's Motivation Scale (CMS) was used to assess levels of apathy. The Johns Hopkins Depression Checklist for Children - HDCL (HDCL) was used to assess for depressive symptoms, and the CBCL assessed presence and degree of behavioural problems. Scores from these measures were used to investigate relationships with apathy. Two participants from each of the three TBI groups presented with apathy. There were no significant differences in degree of apathy across TBI groups. Further analysis showed a significant correlation between CMS scores and HDCL scores, however, CMS scores and CBCL anxious/depressed subscale scores did not significantly correlate. Thus, depression cannot be ruled-out in the case of the apathetic individuals. A significant correlation was also found between CMS scores and social withdrawal scores on the internalizing scale of the CBCL, indicating that symptoms of apathy may manifest in the form of social behavioural problems.

Motivation is a determinant of goal-directed behaviour and is essential for adaptive functioning, therefore disorders of diminished motivation, such as apathy, have the potential to have debilitating effects on quality of life (Marin & Wilkosz, 2005). Children with apathy show reduced motivational drive, interest and ability to carry out a set of actions. They have a decreased capacity in initiating activity and thus engaging in goal-directed behaviours and cognition (Gerring et al., 1996). Apathy, among other neurocognitive impairments, has been identified in patients following traumatic brain injury (TBI) (Marin, Biedrzycki, & Firinciogullari, 1991). Children are a particularly vulnerable population with respect to TBIs. TBI refers to trauma to the brain due to either an open head injury where the skull remains intact, but acceleration-deceleration and rotational forces act on the brain (Zillmer, Spiers, & Culbertson, 2008).

**Definition of Apathy and Diagnostic Issues**

Apathy refers to a deficit in motivation and may present as both a symptom of a disorder and as a syndrome in itself. It has therefore been described as a diagnostic problem within the field of clinical neuropsychiatry (Marin, Wilkosz, 2005; Muller, Czymmek, Thone-Otto, & Von Cramon, 2006). Apathy is considered to be the least severe of three major disorders of diminished motivation (DDM), the other two being abulia and akinetic mutism (Marin & Wilkosz, 2005).

For a diagnosis of apathy, deficits in motivational functioning must exist in the presence of normal mood and level of consciousness and the deficits must not be due to emotional distress or cognitive impairment (Lee & Kultner, 2005; Marin & Wilkosz, 2005). Simultaneous motivational deficits are seen in the goal-related features of emotion, thought content and overt behaviour. Examples of these include flat affect and emotional indifference, decreased future plans or goals and diminished self-initiated action and effort (Marin & Wilkosz, 2005). Patients usually display a lack of insight into their condition and when the condition or their resulting actions are pointed out to them, they often continue to appear indifferent (Marin et al., 1991; Max, Robertson, & Lansing, 2001). Apathetic paediatric patients typically show decreased interest in their family, friends, schoolwork and learning new things. They often show decreased enthusiasm in activities and have problems completing tasks.

Apathy may be a symptom of, or can co-exist with depression (Marin, Firinciogullari, & Biedrzycki, 1993). There is an overlap in apathetic and depressive symptoms. Patients with the syndromes of apathy or depression both present with symptoms of decreased energy, psychomotor retardation and lack of motivation and insight. However, they are distinguishable due to the fact that in the apathy syndrome, lack of motivation occurs in the absence of dysphoric symptoms such as feelings of hopelessness, that are commonly seen in depression sufferers (Marin et al., 1993).

It is important to identify whether the apathetic symptoms are a result of another syndrome or disorder because this has significant implications for the treatment and management of the patient. According to Marin et al. (1991), the treatment of apathy differs when apathy is the primary deficit of motivation-concerned neurological mechanisms compared to when motivation is affected due to emotional distress or due to loss of the cognitive abilities or effector mechanisms. Underdiagnosis of apathy can also have several implications for the patient. If there is failure to diagnose apathy when this syndrome is present, patients may be encouraged to attempt rehabilitation and interventions that require motivational effort when they do not have the capacity to do so which can lead to failure and further decreases in motivation (Marin & Wilkosz, 2005).

The assessment of a patient showing symptoms characteristic of apathy should depend on the etiology of the diminished motivation as well as interacting factors that mediate motivated behaviour as this is useful in both determining a differential diagnosis and devising treatment strategies. This assessment requires a thorough neuropsychiatric examination and evaluation of both the social and physical environment of the patient. Interacting factors may include biological, psychosocial and socioenvironmental factors. When assessing a patient, it is important to determine their baseline motivation as well as the sociocultural factors that influence the variability in their personal interests and goals (Marin & Wilkosz, 2005).

Rating scales that assess loss of motivation are often used in clinical practice to determine whether the patient meets the criteria of the syndrome of apathy and aid in making differential diagnoses (Marin & Wilkosz, 2005). Fewer measures of apathy in children are available compared to available adult measures. Measures for children usually take the form of behavioural scales such as the Child Behavior Checklist (CBCL), a measure of children's behaviour problems and competencies, and the Children's Affective Lability Scale, which

assesses affective regulation (Achenbach, 1991, as cited in Gerring et al.; Gerson et al., 1996).

Gerring et al. (1996) developed the Children's Motivation Scale (CMS) to determine the motivational level of children and adolescents. An informant rated version was developed as children often produce less reliable self-reports. This rating scale may be used when investigating apathy resulting from frontal lobe injury, depression and malnutrition, as well as other conditions seen in children.

**Apathy in Children Following TBI**

Apathy is found in various clinical conditions, particularly neurological conditions including TBIs in both children and adults(Glenn et al., 2002; Lane-Brown & Tate, 2009; Marin et al., 1991; Rao, Spiro, Schretlen, & Cascella, 2007). Yeates et al. (1999) found that children with an increase in postconcussive symptoms after mild closed head injury scored low on a measure of motivation. Many paediatric TBIs result from negligent parental care and supervision or occur during normal playtime when they are running or climbing. Injuries often occur due to pedestrian or motor vehicle accidents, which may be due to a lack of suitable play facilities and road safety education (Semple, Bass, & Peter, 1998).

Despite the high incidence of childhood TBI, limited literature is available concerning apathy in children post-TBI (Gerring et al., 1996; Yeates et al., 1999), although behavioural problems related to decreased motivation may affect a child's quality of life. For instance, in paediatric cases, such impairments can have an adverse effect on the child's functioning with respect to schooling, behaviour and interpersonal relationships (Babikian & Asarnow, 2009). Also, little is known about whether the degree of apathy varies as a function of severity of injury. Barry, Taylor, Klein, & Yeates (1996) found that neurobehavioural symptoms correlate with injury severity among children with moderate to severe TBIs, however, they did not extend their conclusion to children with mild TBI. Researchers conducting studies regarding TBI populations often do not include children or adolescents as the developing brains of these populations may differ in response to injury, as opposed to adult brains (van Reekum, Cohen, & Wong, 2000).

**Etiology and Biological Mechanisms of Apathy Following TBI**

The pathophysiology of apathy may involve damage to the circuits of the frontal-subcortical region of the brain (Lyketsos, Rosenblatt, & Rabins, 2004). The anterior cingulate-subcortical circuit is an organisational network, located partly within the mesial

frontal lobe, which is thought to be involved in motivation (Mega & Cummings, 1994). Apathy can occur damage suffered to the frontal or subcortical regions of this circuit (Bamdad, Ryan, & Warden, 2003; Gerring et al., 1996).

Changes have been observed in neurotransmitter systems weeks after the initial traumatic brain injury has occurred (van Reekum et al., 2000). Forebrain regions in which dopaminergic pathways function, such as the ventral tegmental area (VTA), amygdala, striatum, nucleus accumbens (NA), anterior cingulate cortex, ventral striatum and the dorsolateral and orbital prefrontal cortex, are involved in signalling reward significance and thus play a role in the modifying of one's current motivational state (Mega & Cummings, 1994; Shultz, 2000). Therefore, damage to these areas can result in distorted reward significance, which in turn can lead to apathetic motivational states (Marin & Wilkosz, 2005).

The above-mentioned fronto-subcortical circuits are most likely to be disrupted during TBI due to the anatomical-vulnerability of the frontal area of the brain. For example, diffuse axonal injury often occurs in TBI and may affect many or all frontal sub-systems (Bamdad et al., 2003).

**Consequences and Outcomes**

Often one of the most debilitating consequences of apathy is that the rehabilitation of the patient may be negatively affected, which hinders recovery potential (Lane-Brown & Tate, 2009; Gerring et al., 1996). The patient may not be able to take full advantage of social support available to them or particular rehabilitation programs as their diminished motivation and lack of insight into their condition reduces the success of such programs (G. Newburn & D. Newburn, 2005; Gouick & Gentleman, 2004). Finset and Andersson (2000) report a negative relationship between apathy and approach-oriented coping. This style of coping refers to taking an active approach in dealing with a problem and reinterpreting the problem situation positively. Therefore, the recovery potential of the patient may be negatively affected.

Apathetic children show impaired ability to cope with their ailment and take care of themselves (Gerring et al., 1996). It may also lead to the delayed return of the child to school resulting in the child missing a considerable amount of schoolwork. This can negatively affect his or her academic achievement. Children may also miss out on the school environment where there is a potential for interaction between the child and his or her peers.

It is therefore important that children are assessed and diagnosed appropriately, so that appropriate treatment and rehabilitation strategies are put in place to ensure long-term

rehabilitation success in these children. The child's current level of motivation should be determined and taken into account when devising rehabilitation programs. This will help to ensure greater success in such programs. Rehabilitation is important so that the children can attempt to resume functioning that is as close to normal as possible and achieve appropriate developmental milestones.

TBIs in children can, in particular, place a burden on family members and result in parental distress. Concerns usually include that the child has reduced social skills, finds it hard to make and keep friends and struggles with schoolwork (Prigatano & Gray, 2007).

**Specific Aims and Hypotheses**

There is limited literature regarding apathy in children, particularly following a TBI. The purpose of this research project is to investigate the presence of post-injury apathy in children with a TBI. Comparison of the mild TBI, moderate TBI, severe TBI and typically developing (TD) groups will allow the investigation of whether the degree of apathy varies with injury severity. According to Marin et al. (1993), apathy may be a symptom of or may co-exist with depression. Therefore, apathy and depression are related, but discriminable behavioural dimensions. For that reason, this study will also investigate the relationship between apathy and depression.

The motivational impairments associated with apathy manifest as deficits in the goal-related features of emotion, thought content and overt behaviour. This may include flat affect and emotional indifference, decreased goal-setting and diminished self-initiated action and effort (Marin & Wilkosz, 2005). This study will also investigate the relationship between apathy and real-world behavioural functioning in both post-TBI and TD children by comparing apathy scores on the CMS with scores on the different aspects of the CBCL that reflect internalizing behavioural problems and its domains of anxiety/depression, social withdrawal and somatic problems. Gerring et al. (1996) reports that apathy, as measured by the CMS, and depressive symptoms, as measured by the HDCL, are discriminable. In addition, motivation scores taken from CMS would correlate with the behavioural scales on the CBCL that are related to symptoms of apathy (social withdrawal, internalizing problems), while there would be no correlation between CMS scores and scores taken from the CBCL scales tapping behavioural dimensions that feature symptoms of depression (anxiety/depression, somatic complaints).

Therefore we hypothesised:

1) Degree of apathy varies with severity of injury.

2) A non-significant correlation between CMS and HDCL scores.

3) No significant correlations between CMS and CBCL anxious/depressed scores, and CMS and CBCL somatic complaints scores.

4) Significant correlations between CMS and CBCL social withdrawal scores, and CMS and CBCL internalizing problems scores.

## Method

### Research Design and Setting

This study features a quantitative, quasi-experimental cross-sectional design in which three TBI severity groups (mild, moderate and severe) and one TD group are compared to investigate post-TBI apathy in children.

It incorporates a correlational design between CMS scores and scores on the HDCL, as well as between CMS scores and relevant scores on the CBCL. We used these measures to investigate the relationship between post-TBI apathy and depression, and apathy and behavioural problems, respectively. This research determined scores for children on the CMS, the HDCL and the CBCL through informant versions of these measures. CMS scores provided an indication of degree of apathy, while HDCL and CBCL scores provided an indication of depressive symptoms and internalizing behavioural problems in the sample, respectively.

Data collection took place at the Development Clinic at Red Cross War Memorial Children's Hospital and in an office at Groote Schuur Hospital. In addition, data was collected from the caregivers of two severe TBI children at UCT's Psychology Department and one severe TBI child at a children's home situated in Khayelitsha.

### Participants

The sample included 18 children who have sustained mild ($n$ = 6), moderate ($n$ = 6) and severe ($n$ = 6) TBIs, as well as 6 TD children ($n$ = 6). Their caregivers provided assessments on their behavioural, affective and motivational functioning. TBI participants

were identified through consultation of the trauma register for records of admission of children who had been brought to Red Cross War Memorial Children's Hospital after having sustained a TBI. Scores obtained on the Glasgow Coma Scale (GCS) determined TBI severity. Mild injury corresponds to a GCS score of 13 or higher, moderate injury corresponds to a score of between 9 and 12 and severe injury corresponds to a score of 8 or below (Zillmer, Spiers, & Culbertson, 2008). GCS scores were taken from the patient admission forms completed upon arrival at the hospital. Age, socio-economic and gender matched TD children were recruited from local communities through both random and snowball sampling. A stratified random sampling technique was used in that people were approached on the basis of a child being present in their care. Participating caregivers were asked if they knew of suitable TD children that could take part in this study. This technique of snowball sampling is appropriate when there is difficulty in locating specific members of a population, in this case, matched controls (Babbie, & Mouton, 2008). The inclusion criterion for TBI patient participants was a post-injury period of at least 9 months. Children with previous TBIs and known neurological, developmental or psychiatric disorders were excluded from this study. Inclusion in the TD group was on the basis of being neurologically intact and, as far as possible, matching the demographic variables of the TBI groups.

**Demographic characteristics of the sample.** Although not all caregivers spoke English as their home language, they were all literate in English and could therefore competently provide assessments of the sample. Table 1 provides a detailed description of the demographics of the sample.

Table 1

*Demographic Characteristics of the Sample*

| Variable | Mild TBI ($n$ = 6) | Moderate TBI ($n$ = 6) | Severe TBI ($n$ = 6) | TD ($n$ = 6) |
|---|---|---|---|---|
| Age (years) | | | | |
| Range | 8 -12 | 9 - 13 | 8 - 14 | 8 - 14 |
| Mean (SD) | 10.83 (1.60) | 10.67 (1.51) | 12.00 (2.53) | 10.83 (2.32) |
| Sex: | | | | |
| Males:Females | 5:1 | 6:0 | 5:1 | 5:1 |
| Home Language: | | | | |
| English:Afrikaans:Eng/Afr | 2:2:2 | 3:1:2 | 2:4:0 | 1:2:3 |
| Race: | | | | |
| Black African:Coloured:White | 0:6:0 | 0:6:0 | 0:6:0 | 0:6:0 |
| Household Income: (per annum) | | | | |
| Children's Home | 0 | 0 | 1 | 0 |
| R0 | 0 | 1 | 0 | 0 |
| R1 – R5000 | 1 | 0 | 0 | 1 |
| R5001 – R25 000 | 2 | 1 | 1 | 0 |
| R25 000 – R100 000 | 1 | 2 | 1 | 0 |
| R100 000+ | 1 | 1 | 1 | 2 |

*Note.* There were missing data on household income for eight of the participants due to incomplete forms.

**Measures**

The CMS was used to measure levels of motivation, the HDCL evaluated presence and levels of depressive symptoms and the CBCL assessed behavioural problems in participants. The CMS is a 16-item Likert-type scale developed by Gerring et al. (1996). These developmentally appropriate items reflect the presence or absence of the behavioural, cognitive and emotional aspects of motivation in children. The CMS has both validity and adequate reliability when administered to caregivers by clinicians. The items are simple to read and constructed to be unambiguous. The score on this test can range from 0 to 64. Lower scores indicate a greater degree of apathy.

The HDCL is a 38-item scale that may be used as a screening tool to identify symptoms of major depressive disorder in children (Joshi, Capozzoli, & Coyle, 1990). Items are scored according to a scale of 0 to 4 and the scale's maximum score is 152. Higher scores indicate a greater degree of depressive symptoms. This scale was developed from the major depressive disorder criteria of *DSM-III* and has been standardized on a normal population in which age and sex was controlled for. It is suggested that the HDCL is sensitive indentifying children with major depressive disorder. According to Gerring et al. (1996), the HDCL does

not correlate with the CMS, thus indicating that the few apathy-related items present in this depression scale are insufficient at making the scale sensitive to apathy.

The CBCL is a 118-item scale that assesses the capabilities and behavioural problems of children between the ages of 4 and 18 years (Achenbach, 1991). Total problems are subdivided into two broad syndrome groupings, namely internalizing and externalising problems. This scale has both validity and reliability. Scores drawing on internalizing behaviour correlate with the total score obtained from the CMS. Raw scores are converted to age-standardized T-scores and a T-score greater than 63 is indicative of clinical behavioural problems.

These measures were administered to caregivers of the children in the study. The CMS and the HDCL exist as informant versions and are therefore designed to be objective. Informant versions were produced as children often produce less reliable self-reports (Gerring et al., 1996). The CBCL exists in parent, teacher and youth self-report versions. In this study, caregivers completed the parent version of the CBCL. In addition to the above measures, caregivers completed a parent information questionnaire and asset index (Appendix A), and a paediatric neuropsychology developmental questionnaire (Appendix B) to get an indication of their socioeconomic background and their children's developmental history, respectively.

**Procedure**

Caregivers of potential participants were contacted telephonically. On the day of testing, the purpose and procedure of the study were reiterated and informed consent obtained (Appendix C). Caregivers were informed that they could withdraw from the study at any point without consequences.

The parent information questionnaire and asset index, and the paediatric neuropsychology developmental questionnaire were administered to the caregivers, followed by the CMS, the HDCL and the CBCL. Each caregiver completed all the measures in a single session.

This study followed ethical guidelines for research using human subjects as outlined by the University of Cape Town (UCT). Approval was obtained from the Department of Psychology's Research Ethics Committee, as well as the Faculty of Health Sciences Human Research Ethics Committee (HREC REF: 276/2010).

**Statistical Analysis**

All data analyses were completed using Statistical Package for the Social Sciences (SPSS) version 18.0. The independent variable (IV) is level of injury severity. The IV has four levels, which are the mild, moderate and severe TBI and TD. The dependent variables are the outcome scores obtained from the CMS, the HDCL and the CBCL. Detailed descriptive statistics provide an indication of the clinical characteristics of the children in the study and were used to examine the variability in the set of outcome scores. A one-way analysis of variance (ANOVA) was performed to compare CMS scores between the groups. Levene's test for homogeneity of variance was not significant, $F(3, 20) = 2.29$, $p = .11$. The assumptions of homogeneity of variance, normality and independence of observations that underlie parametric statistical tests were upheld. Boxplots were constructed for the IV to identify outliers that may influence measures of central tendency of the CMS scores. Correlation analysis was performed on total CMS and HDCL scores, as well as between total CMS scores and relevant sores on the CBCL to investigate the relationship between apathy and the variables measured by the HDCL and CBCL. Calculation of the effect size of these correlations using Pearson's correlation coefficient ($r$) provided an indication of the magnitude of the relationship between these variables. Statistical significance was set at a level of $\alpha = 0.05$.

## Results

We derived a cut-off score on the motivation scale by taking 2 standard deviations (SD) from the normative sample's mean (Gerring et al., 1996). This gave us a cut-off score of 31.61. Scores below 31.61 were thus taken to suggest significant motivational impairments in the form of apathy. Using this cut-off, apathy was present in 25% of the sample ($n = 6$). This quarter of the sample was made up of an equal number of individuals in each of the TBI groups (mild: $n = 2$; moderate: $n = 2$; severe: $n = 2$). There was no apathy present in the TD group.

The results of a one-way ANOVA comparing CMS scores between the groups, as well as relevant descriptive statistics, is shown in table 2. Examination of the means reveals that there were similar apathy scores for the mild TBI and TD groups, and for the moderate and severe TBI groups. The between-group comparison revealed no significant difference in degree of apathy.

The magnitude of the effect size is small. A calculation of power indicates that with the current sample size, the chance of finding a significant difference between the groups is 42%. This suggests that a greater sample size may result in significant group differences.

Table 2

*Between-Group Comparisons of Scores on the CMS*

| Variable | CMS | F | | | ESE | Observed power |
|---|---|---|---|---|---|---|
| | | | *df* | *p* | Partial $\eta^2$ | ($\alpha = .05$) |
| Mild TBI ($n = 6$) | 42.83 (12.45) | 1.92 | 3, 20 | .16 | .22 | .42 |
| Moderate TBI ($n = 6$) | 35.33 (9.05) | | | | | |
| Severe TBI ($n = 6$) | 36.50 (7.94) | | | | | |
| TD ($n = 6$) | 45.83 (4.12) | | | | | |

*Note.* Means are presented with standard deviations in parentheses. ESE = Estimate of effect size.

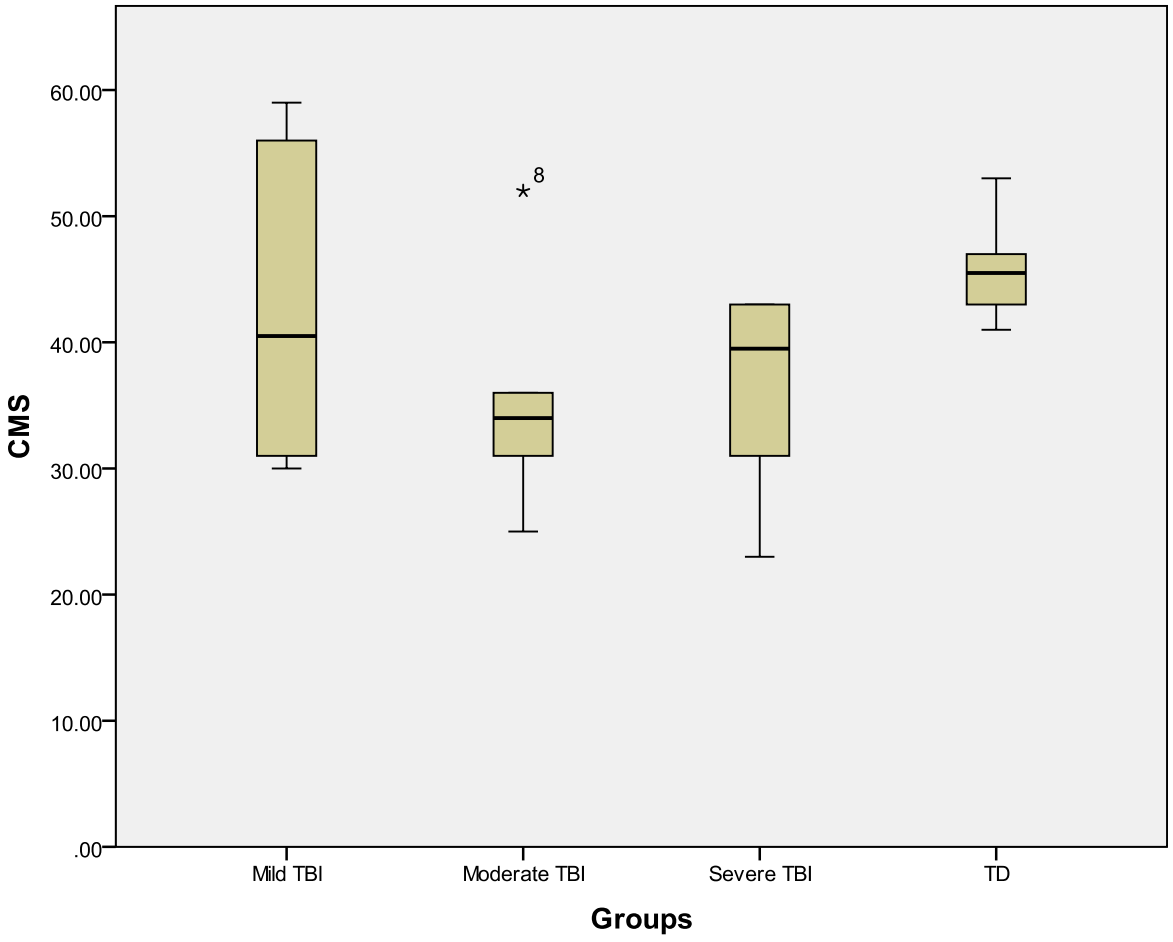


*Figure 1.* Boxplots for distributions of CMS scores.

Figure 1 shows that scores for the mild TBI group and severe TBI group are distributed relatively above and below the mean, respectively. There is a greater spread of scores for the mild TBI group. The moderate TBI and TD groups had similar distributions. An outlier is seen in the moderate TBI group. This score was much higher than other scores obtained in the group, and as such, may have a biasing effect on the mean CMS score for this group.

Descriptive statistics for the HDCL and the internalising problems subscale of the CBCL, as well as its domains of anxious/depressed, social withdrawal and somatic complaints, are presented in table 3. Mean T-scores on the CBCL showed that the mild TBI and the TD groups did not present with any clinical internalizing behavioural problems. The moderate TBI group was found to have clinical internalizing behavioural problems, as well as clinical problems in the internalizing behaviour domains of anxiety/depression and somatic complaints. The severe TBI group presented with clinical social withdrawal behavioural problems.

Depressive symptoms were present in 62.5% of the sample ($n$ = 15) with a score two standard deviations above the mean which corresponded to a score of 36 or above on the HDCL. This portion of the sample was made up of different numbers of individuals in all of the TBI groups (mild: $n$ =2; moderate: $n$ = 6; severe: $n$ = 5), as well as in the TD group ($n$ = 2).

Table 3

*Descriptive Statistics for Scores on the HDCL and CBCL*

| Variable | HDCL | CBCL | | | |
|---|---|---|---|---|---|
| | | Anxious/depressed | Social withdrawal | Somatic complaints | Internalising problems |
| Mild TBI ($n$ = 6) | 36.67 (13.79) | 58.83 (7.99) | 62.33 (12.01) | 60.17 (10.57) | 61.33 (9.16) |
| Moderate TBI ($n$ = 6) | 55.50 (14.40) | 70.67* (8.41) | 62.17 (3.60) | 63.33* (9.50) | 68.00* (7.46) |
| Severe TBI ($n$ = 6) | 39.83 (10.55) | 57.33 (4.18) | 64.33* (4.63) | 55.50 (3.02) | 60.83 (1.94) |
| TD ($n$ = 6) | 33.83 (9.11) | 53.67 (1.97) | 61.33 (9.520 | 55.83 (4.79) | 57.83 (5.34) |

*Note.* Means are presented with standard deviations in parentheses. *T-scores above 63 indicate clinical behavioural problems.

Correlation analysis was used to investigate the relationship between apathy symptoms and depressive symptoms, and between apathy symptoms and internalizing behavioural problems. There was a significant negative correlation between motivation scores on the CMS and HDCL scores reflecting depressive symptoms, which means that as scores on the CMS decrease (greater degree of apathy), HDCL scores increase (greater degree of depressive symptoms) or visa versa.

Scores on the CBCL that reflect anxious/depressed behaviour, as well as somatic complaints, did not significantly correlate with motivation scores on the CMS. CMS scores and scores on the CBCL social withdrawal domain were significantly correlated in a negative direction, indicating that as CMS scores decrease (greater degree of apathy), CBCL social withdrawal scores increase (greater social withdrawal behavioural problems) or visa versa. A significant negative correlation was also found between CMS scores and overall internalizing behavioural problems which means that decreasing CMS scores (greater degree of apathy) are associated with increasing CBCL internalizing behaviour scores (greater internalizing behavioural problems) or visa versa.

The effect size for the correlation between CMS and CBCL somatic complaints scores was small, however, there was a medium effect size for all other correlations. Details of the correlation analyses is provided in table 4.

Table 4

*Correlations Between CMS Scores and Scores on the HDCL and CBCL*

| Variable | r | $R^2$ | *P* |
|---|---|---|---|
| HDCL (*n* = 24) | -.43 | .19 | .03* |
| CBCL (*n* = 24): | | | |
| Anxious/depressed | -.35 | .13 | .09 |
| Social withdrawal | -.48 | .23 | .02* |
| Somatic complaints | -.14 | .02 | .52 |
| Internalizing problems | -.43 | .19 | .04* |

*Note.* *p < .05

## Discussion

Paediatric TBI often results in disability in the form of neurocognitive impairments (Babikian & Asarnow, 2009). This study aimed to investigate deficits in motivational functioning in children following TBI and therefore the CMS was used to determine whether post-injury symptoms of apathy were present in the sample. In addition, this study investigated whether degree of apathy varied with injury severity by comparing groups of children with different levels of TBI severity (mild, moderate and severe) and a group of TD children. Two participants in each of the three TBI groups presented with apathy, while apathy was not present in the TD group. This is consistent with the results obtained by Gerring et al. (1996) who found that a clinical population of paediatric patients presented with greater levels of apathy that the normal population. Although one may be inclined to think that this suggests an association between apathetic symptoms and TBI, this finding is inconclusive. Between-group comparisons revealed no significance difference in degree of apathy, thus disconfirming the first hypothesis. There were variations in scores within the groups, most notably within the mild TBI group. There was one outlying score in the moderate TBI group, which may have inflated the mean CMS score for this group. It is likely that the small sample size, together with these variations, resulted in the inability to reach statistical significance when groups were compared.

It is well documented that while apathy can occur as a stand-alone syndrome, it frequently co-occurs with and may be a symptom of depression (Marin, 1990; Marin et al., 1993; Kant, Duffy, & Pivovarnik, 1998). There is an overlap between symptoms of apathy and depression including diminished motivation, psychomotor retardation and decreased energy. Both sets of patients usually display a lack of insight into their deficits. Depression and apathy are nevertheless discriminable dimensions of behaviour and certain features of depression such as dysphoric mood and somatic complaints, are not shared by the syndrome of apathy (Marin et al., 1993; Gerring et al., 1996). Marin et al. (1991) notes that clinicians often make the assumption that apathetic patients are suffering from depression when they are not familiar with the differential diagnosis of apathy and depression.

This study investigated the relationship between apathy and depression, based on the evidence of this frequent co-occurrence and shared features. In order to do this, the HDCL was chosen to provide informant ratings of depressive symptoms in the sample. Ratings from

this scale revealed that certain participants from each of the four groups presented with varying levels of depressive symptoms.

According to the second hypothesis, it was expected that CMS scores and scores on the HDCL would not be significantly correlated with one other. However, it was found that the CMS and HDCL scores did in fact significantly correlate, in a negative direction of medium effect. This finding contradicts the relationship found between CMS and HDCL scores by Gerring et al. (1996), who used their non-significant correlation finding to provide evidence for the discriminability of apathy and depression in child populations.

The significant correlation between apathy scores on the CMS and depressive symptoms scores on the HDCL suggest that we cannot discriminate between apathy and depression in our sample; an additional reason for our results being deemed inconclusive. This means that symptoms of apathy displayed by participants of the TBI groups may actually be a reflection of depressive symptoms instead. Thus, depression cannot be ruled-out in the case of the apathetic individuals.

Apathy can be viewed as an observable behavioural syndrome where a quantitative decrease in seen in goal-directed behaviour (Levy, & Dubois, 2006). Marin and Wilkosz (2005) describe dimensions affected by the motivational deficit in apathy such as the goal-related features of emotion and thought content. Apathetic patients exhibit reduced effort, flat affect and emotional indifference. In apathetic TBI children, such behavioural impairments can negatively impact school performance, in both developing current skills and acquiring new skills. In addition, interpersonal relationships are affected and so peer and environmental interaction is reduced (Keenan, & Bratton, 2006; Babikian, & Asarnow, 2009).

Therefore, in order to investigate the relationship between apathy and real-world behavioural functioning in both post-TBI and TD children, motivation scores on the CMS were compared with scores on the different aspects of the CBCL that reflect internalizing behavioural problems and its domains of anxiety/depression, social withdrawal and somatic problems.

According to the third hypothesis, it was expected that there would be no significant correlations between CMS and CBCL anxious/depressed scores (in line with our previous hypothesis), and CMS and CBCL somatic complaints scores. Items in the anxious/depressed and somatic complaints domains of the CBCL describe behaviours associated with the disorder of depression. This hypothesis was confirmed in that there were no significant correlations between CMS scores and scores on these domains. This finding is in accordance

with those of Gerring et al. (1996). This may provide evidence for discriminating between the constructs of apathy and depression in the sample. However, the finding is inconsistent with the results of a correlation between CMS scores and scores taken from an objective screening measure for depressive symptoms, as described above. Therefore, it cannot be inferred that apathy and depression are discriminated within the sample based on these contradictory findings.

According to hypothesis four, it was expected that there would be significant correlations between CMS and CBCL social withdrawal scores, and CMS and CBCL internalizing problem scores. This hypothesis was confirmed as correlations between the CMs and these measures were found to be significant and this finding is consistent with that of Gerring et al. (1996). This suggests that the degree of apathy assessed by the CMS is associated with the real-world behaviours of social withdrawal and broader internalizing problems. Such behaviours are most similar to those seen in apathetic children such as diminished socialization, lack of interest in others and the environment, as well as preference for being alone (Brown, & Pluck, 2000). More broadly, this correlation suggests that the behavioural functioning of apathetic children is reflective of the negative symptoms of the syndrome of apathy.

**Limitations and Directions for Future Research**

The major limitation of this study is that the size of the sample was too small to be sufficiently powered to achieve a significant difference in degree of apathy between the groups. Therefore, future studies should focus on obtaining a greater sample size. This difficulty in obtaining an adequate sample size is, however, a shared logistical challenge amongst researchers looking at clinical populations such as paediatric TBI (pTBI) (Adelson, 2010). In addition, there is further difficulty in accessing moderate and severe TBI patients since moderate and severe TBI occur at lower rates than mild TBI. Typically, the percentage rates of TBI severity in a population is mild, 80%; moderate, 10%; and severe, 10% (Bruns, & Hauser, 2003).

The sample in this study comprised of only one population group. Future research on apathy in South Africa (SA) should endeavor to obtain a sample that may be more representative of the broader SA population, so that there is increased generalizability of the results. Greater generalizability may also be obtained through a sample of more equal numbers male and female participants. Nolen-Hoeksema and Girgus (1994) note that gender differences in depressive symptoms are thought to emerge during adolescence. In addition,

internalizing behaviour problems are thought to be more prevalent in females (Nolen-Hoeksema, & Girhus, 1994; Angold, & Costello, 2006). The majority of participants in the sample were male, therefore, differing levels of depressive symptoms and internalizing behavioural problems may have been seen had the sample included a more equal representation of gender. It is, however, important to note that males are known to be at a higher risk for TBI than females and therefore TBI populations usually have higher ratios of males than females (Bruns, & Hauser, 2003). Two methods of sampling procedures were used to recruit the TD children. It is suggested that future studies should be more consistent in this regard.

The wide age range for this study may have affected the results obtained, since children of different ages may be at different stages of development which in turn can affect their abilities and willingness for social interaction. Stage theories of development can offer a theoretical perspective on this (Weiten, 2004). It is suggested that future research make use of a more narrow age range so that children in similar stages of development can be compared.

Only informant rater scales were used in this study. While, informant assessments of motivation are recommended, future studies should explore the use of self-report measures for behavioural functioning. Lack of insight is commonly seen in apathetic patients. Because of the presence of that symptom, it is suggested that informant rating scales provide a more reliable description of the motivation level of the patient, however, self-report scales for the assessment of behavioural problems are suggested to provide more accurate evaluations. Van der Ende and Verhulst (2005) have found that adolescents rated themselves higher on a measure of problem behaviours than did their parents, while teachers reported more problem behaviours than parents. It would therefore be useful to obtain both parent and teacher assessments of behavioural functioning in the case of apathetic children to obtain a more accurate assessment and get an indication of the child's functioning in a school setting.

An investigation such as this of the presence of post-injury apathy in TBI children and the relationships that apathy has with depression and behavioural functioning in children, allows for a better understanding of the syndrome of apathy and how it manifests in children following TBIs. The findings presented here may provide further evidence of the presence of post-TBI apathy. However, this is inconclusive as depression could not be ruled out in this particular sample. It does suggest that deficits in real-world behavioural functioning may be associated with the degree of apathy seen in these children. This finding is also inconclusive, however, due to the significant correlation that was found between apathy and depressive

symptoms scores and the subsequent inability to rule out depression in the sample. Since apathy can hamper the recovery potential of children that have sustained TBIs (Gerring et al., 1996), it is important that children who have sustained TBIs be assessed post-injury for the presence of apathy so that appropriate treatment and rehabilitation strategies are put in place to ensure long-term rehabilitation and recovery success in these children.