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**Friendship and Psychosocial Functioning in Children who  
have Sustained a Traumatic Brain Injury**

AND CLINICAL RESEARCH PORTFOLIO

Part 1

(Part 2 bound separately)

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**Section of Psychological Medicine**

**University of Glasgow**

**July 2010**

*Submitted in partial fulfilment of the requirements for the degree of Doctorate in Clinical Psychology (D.Clin.Psy)*

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## **CHAPTER ONE: SYSTEMATIC LITERATURE REVIEW**

**The effectiveness of interventions aimed at alleviating cognitive and psychosocial problems in children following acquired brain injury – A systematic review.**

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**Abstract:**

Objective: It is now generally accepted that paediatric acquired brain injury (ABI) can have an impact on cognitive, social and behavioural functioning in children. However, there is a lack of guidance in terms of effective interventions for children and their families when these difficulties occur, particularly beyond the acute recovery phase. The present study systematically reviews evidence for the effectiveness of interventions aimed at alleviating cognitive and psychosocial outcomes following paediatric ABI, after the acute-recovery phase. Method: A search was performed of the Ovid Medline, EMBASE, Web of Knowledge and EBSCO databases. Nine studies were identified that met inclusion criteria; five cognitive intervention studies and four psychosocial outcome studies. Effect sizes and methodological quality rating were calculated for each study.

Results: From the nine studies, only two were rated as high quality. In terms of cognitive outcomes, there was some evidence that interventions alleviated attentional, memory and learning difficulties. In terms of psychosocial outcomes, there was some evidence that interventions alleviated internalising symptoms. Conclusions: Whilst there are some encouraging findings, there is a need for further and more rigorously designed controlled research. Gaps in the evidence base and future research directions are discussed. There is a need for future research to consider age appropriate interventions and to differentiate between ABI diagnostic groups. There is also a need to determine optimum post-injury factors, such as the timing of interventions for optimum affects.

Keywords: *cognitive, psychosocial, paediatric, pediatric, TBI, ABI, systematic review.*



## **Introduction**

Acquired brain injury (ABI) includes closed and open traumatic brain injury (TBI), central nervous system infections such as meningitis, brain tumours, toxin and radiation damage, hypoxia and stroke [1]. It is now generally accepted that paediatric ABI can affect a child's cognitive, behavioural and social functioning [2]. Despite this, there is wide variability in the type and intensity of treatments received by children after ABI. It has been suggested that after acute recovery there is a lack of rehabilitation and support as the injury often results in no outward physical indicators and may therefore be overlooked [3].

The literature around interventions for adults with ABI is much more advanced than child literature [4]. This may, in part, be related to the ongoing plasticity or early vulnerability debate relating to childhood brain injury. The plasticity theory suggests that the earlier the brain insult the better the functional outcome. There is evidence, for example, that there is cortical reorganisation and greater sparing of cognitive functioning if injuries occur at a younger age [5]. However, Anderson et al [6] did not find evidence in support of this theory in their study of cognitive functioning in children who had sustained a TBI. They found that brain injury in infancy was more detrimental than in later life. In support of the early vulnerability theory, the rehabilitation literature broadly suggests that even if children appear relatively functionally intact immediately post-insult, they may fail to keep up with their non-injured peers in terms of developmental gains as they get older. This has led to the clinical impression of children with ABI “growing into” their deficits [7]. This therefore highlights the need for effective interventions in children with ABI, to ensure that these children do not go on to develop further difficulties and that the gap

between them and their non-injured peers is minimised. It also highlights the need for interventions to be available throughout the lifespan, as cognitive and psychosocial difficulties may not become apparent until later in life.

This article therefore aims to review the literature around the effectiveness of interventions aimed at alleviating cognitive and psychosocial difficulties in children following ABI. It focuses on interventions administered after the acute recovery phase; due to the evidence suggesting that there is a lack of longer-term community based support. Before presenting the evidence for interventions we summarise the literature around cognitive and psychosocial outcomes following paediatric ABI, highlighting specific areas of concern.

### Cognitive Outcomes

Deficits in the domains of attention, memory and executive functioning have been found following paediatric ABI, which can have an impact on a child's school, home and community life [8]. Babikian and Asarnow [9] reviewed neurocognitive outcomes following paediatric TBI. They studied mild, moderate and severe TBI groups and found evidence of a dose-response relationship between injury severity and neurocognitive outcomes. In the severe TBI group, they found moderate to large effects in terms of performance IQ, executive functioning, processing speed, attention, verbal immediate and delayed memory. They found that despite some recovery over the course of the first two years post injury, the severe TBI group, failed to catch up with their non-injured peers and also fell further behind over time in most neurocognitive domains. They

highlighted the importance of focussed and specific cognitive interventions in children with severe TBI.

### Psychosocial Outcomes

There is evidence to suggest that even mild paediatric brain injury is related to psychosocial difficulties [10]. McKinlay and colleagues [11] found that preschool mild TBI was associated with persistent negative effects on psychosocial development in adolescence. Adolescents who were hospitalised during their preschool years for mild TBI were significantly more likely to show symptoms of attentional deficit/hyperactivity disorder, conduct disorder, substance abuse and mood disorders. A study that compared children with mild, moderate or severe TBI to a control group of sex, age and socio-economic status matched children found that children with TBI had significantly lower levels of self-esteem, higher levels of loneliness and higher rates of maladaptive and anti-social behaviour [12]. Children who had sustained a TBI also describe themselves as less socially competent than children without brain injuries [12] and children with more severe injuries have fewer friends [13]. Janusz et al [14] compared children with moderate TBI, severe TBI and children with orthopaedic injuries and found that children with more severe brain injuries showed deficits in their social problem solving skills. Fletcher et al [2] found that severely injured children had more problems at school and fewer social activities than less severely injured groups.

It has also been well documented that behavioural difficulties often present following paediatric ABI [15]. This may be the result of dis-inhibition, irritability and anger control issues as well as other difficulties adjusting to the brain injury. In fact, estimates of new

behavioural disorders in children following TBI have ranged from around 35% [16] to 70% [17]. The social and behavioural difficulties described above may also have an impact not only on the child and their peer relationships but also on family relationships and there is evidence of family strain, emotional difficulties and burden in families of children with ABI [18]. Wade and colleagues [19] argue for the use of family-centred approaches when intervening with children who have an ABI. They argue that ABI affects the whole family, parents experience high levels of distress when facing physical and personality changes in their child, and children experience a number of psychosocial problems as a result of the injury, that are often inadequately addressed.

It is apparent that there is evidence of psychosocial and cognitive difficulties in children following ABI and therefore a need for effective interventions. We therefore aim to provide a systematic review of the literature surrounding interventions aimed at alleviating cognitive or psychosocial problems in children following acquired brain injury to determine if there are effective interventions for these difficulties.

### Research Questions

- i) Are there effective interventions in terms of alleviating cognitive outcomes following paediatric ABI?
- ii) Are there effective interventions in terms of alleviating psychosocial outcomes following paediatric ABI?

## **Method**

### Search Strategy

Studies were sought via the Ovid Medline, EMBASE, Web of Knowledge and EBSCO databases (PsycINFO, CINAHL, Health Source: Nursing and Academic Section, International Bibliography of the social scientist, Professional Development Collection, PsycARTICLES, Psychology & Behavioural Sciences Collection, SocINDEX) by searching the following text words:

- 1) (acquired brain injur\* or acquired head injur\* or traumatic brain injur\* or traumatic head injur\*)
- 2) (intervention\* or rehabilitat\* or train\*)
- 3) (psycho?social or social\* or behavio?r\* or emotion\* or anx\* or cognitive or peer or distress\* or memor\* or attention or executive)
- 4) (school?age or pre?school or child or children or adolesc\* or teen\* or youth or paediatric or pediatric or childhood)

\* and ? symbols denotes database operator, which includes truncations or possible extra letters in the term to be included within the search.

The four searches were then combined using “AND”. Table 1 provides a flow diagram of the search strategy. The initial search yielded a total of 536 papers published in or prior to the third week of March 2010. The author then applied the following inclusion and exclusion criteria. Inclusion criteria: (1) Intervention studies addressing cognitive or psychosocial outcomes, (2) participants aged up to 18 years, (3) peer reviewed journal articles. Exclusion criteria: (1) articles not addressing intervention, (2) theoretical articles or descriptions of rehabilitation programmes, with no specific intervention, (3) review articles, (4) articles without adequate specification of interventions, (5) articles that did

not include participants with a primary diagnosis of acquired brain injury or traumatic brain injury, (6) single case reports or series of multiple baseline experiments, (7) articles describing surgical or pharmacological interventions, (8) articles not written in English, (9) studies focussing on outcomes following childhood cancers only, as this population may have distinct psychosocial difficulties not present within the general ABI population, (10) studies whereby participants were less than 3 months post-injury as post-concussive symptoms are thought to resolve around this time and therefore this is after the acute recovery time [7], (11) studies that did not utilise standardised outcome measures. Given the above exclusion criteria, 394 articles were excluded on title alone, mainly due to not being intervention studies or being surgical or pharmacological intervention studies. Of the remaining 142, a further 112 articles were excluded based on their abstract as they did not fulfil the specified inclusion and exclusion criteria. Again, this was mainly due to the studies not relating to a direct intervention. This left a full article search of the remaining 30 studies, which were read in their entirety, of which 19 [20 – 38] were excluded for the reasons specified in Table 1.

A hand search of the journals *Neuropsychology* and the *Journal of Head Trauma Rehabilitation* was carried out for the past ten years. These journals were chosen as they yielded the highest quality included study or included two studies that were cited most frequently in the literature. No additional articles that met inclusion criteria were identified in these searches.

This left a total 11 articles for review. Through reading the papers, it became apparent that there were two distinct types of studies, those aimed at reducing cognitive difficulties and intervention studies aimed at improving psychosocial outcomes. Therefore papers

were split into two research areas: cognitive outcomes and psychosocial outcomes. There were six studies assessing cognitive outcomes; two of these reported the same primary data and therefore counted as one study, leaving five cognitive intervention articles. Two were pre and post design, single group studies and three were RCT's or group-controlled studies. There were five articles assessing psychosocial outcomes; two of these were the same primary data published separately, leaving four studies. Two were RCT's, the other two were single group pre and post designed studies.

*{Insert Table 1 around here}*

#### Calculation of effect size

Effect sizes had been calculated by the authors for three of the articles [39, 40 & 19].

Two papers calculated these based on partial-eta squared. Wade et al [19] appear to have used a variant of Hedge's g for pre-post design studies. This method is less susceptible to potential sources of bias [42] and was the preferred procedure for calculating effect sizes in a similar review of adult literature [43] and was therefore used to calculate effect sizes in this review. Equation 1 is the formula used to calculate effect sizes for single group pretest-posttest designs and equation 2 for independent group pretest-posttest designs:

$$\text{Equation 1: } (M_{\text{post, Exp}} - M_{\text{pre, Exp}}) \div (SD_{\text{pre, Exp}})$$

$$\text{Equation 2: } \{(M_{\text{post, Exp}} - M_{\text{pre, Exp}}) \div (SD_{\text{pre, Exp}})\} - \{(M_{\text{post, Con}} - M_{\text{pre, Con}}) \div (SD_{\text{pre, con}})\}$$

\*M = mean, Exp = experimental group, Con = Control group, Post = posttest and Pre = Pretest, SD = standard deviation

When there were multiple dependent variables, effect sizes were calculated as the mean effect sizes for all dependent variables within the study or if summary scores were used, effect sizes were calculated based on these scores. There was insufficient information in one of the articles to calculate effect sizes [44 & 45].

### Methodological appraisal of included studies

A methodological appraisal of the articles was applied to all 9 studies according to the criteria in appendices. These were based on the CONSORT guidelines with additional items that were specific to the ABI population. There were 26 items, and studies were awarded a score 1 if the criterion was met and 0 if the criterion was not met or it was not possible to determine from information given. Therefore, each paper was given a rating out of 26, with higher scores indicating superior methods. Papers that met 75% of the methodological criterion specified were considered to be of 'high' quality. Papers that rated between 50% and 75% were deemed to have a 'moderate' quality rating and those studies that achieved less the 50% quality rating were considered to be of 'lower' quality. To assess the reliability of this tool, a second reviewer using the same tool rated all 9 studies. Overall percentage agreement was high (98%). Individual disagreements were resolved by discussion with the independent reviewer.

### **Results**

Tables 2 and 3 show the methodological quality ratings for cognitive and psychosocial outcome studies respectively.



## Cognitive Outcomes

*{Insert Table 2 around here}*

In the cognitive outcomes domain, one study was of ‘high’ quality, three were ‘moderate’ one was of low methodological quality.

### *High Quality*

Galbiati et al [46] compared a treatment group who received attention-specific neuropsychological training and a control-group who had opted out of the training programme. The training programme was relatively intense, with 45-minute sessions with a therapist offered 4 times per week for 6 months. Large effect sizes were found in terms of attention, which included measures of impulsivity and distractibility. A small effect in terms of overall intellectual functioning was found. This paper was of particularly high methodological quality, scoring the highest methodological rating of all included studies. However, the confounding factor of time with therapist was not controlled.

### *Moderate / Low Quality*

The Amsterdam Memory and Attention Training for Children (AMAT-c) is a child specific cognitive rehabilitation programme that focuses on: sustained attention, focused attention, divided attention, memory strategies and repetition. The training takes place on a one-to-one basis and is relatively intensive. Van’t Hooft et al [44] studied the efficacy of the AMAT-c programme in a randomised controlled trial. At six months post intervention improvements in selective attention and verbal working memory were sustained in the treatment group. However, due to limited information, effect sizes could

not be calculated. Therefore while significant effects were found, it is difficult to ascertain the extent of the AMAT-c intervention effects.

Sjo et al [47] applied the AMAT-c programme in a school setting to a group of children with ABI. Despite a significant change in terms of attention, the overall effect size on attention was found to be small but medium effects were found in terms of learning and memory. However, there were significant methodological flaws including the absence of a comparison group, creating difficulty attributing the results principally to the intervention.

Brett and Lattsch [48] also studied the effectiveness of an individualised school based cognitive rehabilitation programme for children with ABI. The programme had an overall large effect in terms of the memory measure. However, it is difficult to rule out that these effects were due to the ongoing recovery process or passage of time as there was no control group. There was also no mention of the severity of ABI in the participants, which makes it difficult to ascertain how representative the sample was.

Braga et al [49] looked at cognitive outcomes in a group of children with TBI. They had two treatment conditions, a direct clinician delivered intervention group and an indirect family treatment group. Both groups were treated by the same professionals but in the indirect family supported group, the family members implemented the intervention with bi-weekly support from care managers after initially receiving intensive training. In the direct clinician-delivered clinic based intervention, specialists using conventional rehabilitation procedures conducted all interventions without the parent present. Parents in both groups attended a support group. In terms of general intellectual functioning, the direct clinician delivered treatment group showed no significant change and a small effect

size, while the indirect family-supported treatment group showed improvement with a moderate effect size. The authors speculate that this may be because the intervention was more intense when provided by parents in everyday life or lower levels of parental stress may influence the results, as parents feel involved in their child's care. This article has a number of strengths in terms of its design, including being a well-described RCT with those measuring outcomes blind to the child's treatment condition.

### Psychosocial Outcomes

*{Insert Table 3 around here}*

One of the four studies, one was rated as 'high' quality, two were 'moderate' and one was of 'low' methodological quality.

#### *High Quality*

Wade et al's [39] was rated as the highest methodological quality study, and looked at the efficacy of an online family problem solving intervention in an RCT. This was a well-controlled study, whereby the control group received high-speed Internet access and had access to the same chat rooms and online support groups as the treatment group but did not have access to the 14 intervention sessions or the sessions with the therapist. There were no significant differences found between the treatment and control group in terms of behaviour or externalising difficulties; however, small to medium effects were found for internalising difficulties. The results suggest that post-treatment, children in the treatment group were more compliant with parental requests. The authors suggest that these changes may have a positive impact in terms of psychosocial functioning, as the

children may be able to control themselves better in social situations. However, it is important to note there were no direct measures of social competence and all measures were parent-completed. This article has a number of methodological strengths and the authors go some way to teasing out characteristics of individuals who may benefit most from the intervention. They conducted a number of multiple regressions and found large treatment effects for children of lower socio-economic status and children older than 11 years. However, the sample was skewed towards less severe injuries and there were two families who dropped out of treatment, both of which had children who had more significant social deficits, as measured by lower social competency scores at baseline.

*Moderate / Low Quality*

In another RCT, Wade and colleagues [40] studied the efficacy of a relatively short family problem solving intervention of 7 sessions and up to 4 extra individualised sessions over a 6 month period. As in the previous study, medium effect sizes were found for internalising difficulties, such as anxiety/depression, and withdrawal difficulties. There was a medium effect for parent-child interaction and the authors speculate that there may be a ceiling effect in terms of this measure. Therefore, it appears that a relatively brief family based problem solving intervention can reduce internalising difficulties in children with TBI. There are a number of methodological strengths to this article and it asks for the child's perspective on parent-child interactions, however, all behavioural measures were parent completed. A major limitation of the study is that families in both groups continued to receive psychosocial treatments that they were previously receiving. This makes it difficult to attribute changes to the family-centred problem-solving intervention alone.

Wade et al [19 & 41] also conducted a single group before and after trial that evaluated the effectiveness of the online version of the family problem-solving intervention.

Families were also given a weekly video conference session with a therapist. They found this intervention to be feasible for both the child with ABI and family members. While the intervention had an effect on child and parental adjustment, there were several limitations to the study, for example, there was a small convenience sample of 6 children with TBI and there was no control group, which makes it difficult to attribute changes to the intervention. Also, it is important to note that only two measures were completed by the child and in the child depression report, mean depressive symptoms rose slightly, albeit still in the normal range.

Wiseman-Hakes et al [50] evaluated an intervention aimed at alleviating pragmatic communication deficits. They suggest that improved pragmatic skills would have a ‘ripple effect’ in terms of social competency. The sample size was small and represented a heterogeneous group of inpatients and outpatients, closed head injury and ABI and time post-injury ranged from 3 months to 9 years. The programme was relatively intensive and significant results were observed in terms of pragmatic communication skills.

However, both measures of pragmatic communication skills were observational tools completed by a research assistant. As there was no control group, we might assume that the rater was not blind to the treatment that the participants received, hence introducing a potential bias. There was no difference in terms of the Vineland Adaptive Behavioural Scale, a main outcome measure and therefore limited evidence for the ‘ripple effect’ in terms of social competence. It is also noteworthy that outcome measures were completed by proxies and not by the adolescents themselves in terms of their appraisal of social

competence. Therefore, although this article provides evidence of improvement in pragmatic communication skills following the intervention, there is little evidence of this having a positive impact on the adolescents psychosocial functioning in everyday life.

## **Discussion**

### Cognitive – Main Outcomes

In terms of cognitive outcomes, two group comparison studies provide evidence of effective interventions in improving attention [44, 45 & 46]. It was only possible to calculate effect sizes for one of these studies [46] and these proved to be large, as well as statistically significant. There was also evidence from one study that the attentional improvements were sustained at six months follow-up [45]. The literature also provides evidence for the efficacy of interventions for alleviating memory and learning difficulties [44, 47, 48] and there is some evidence that these positive effects are sustained six months post intervention [45]. However, the methodological quality of these studies varies more than for attentional outcomes; with two of the studies failing to utilise control groups. Therefore it cannot be concluded with certainty that it is the intervention itself causing the effects and is not the result of having a supportive therapeutic relationship. The evidence of the effectiveness of interventions in terms of improving general intellectual functioning is not as encouraging. Galbiati et al's [46] study found no differences in this measure. However, Braga et al [49] did find superior outcomes using the WISC III in their family supported intervention compared to the direct clinician intervention. This may suggest that the involvement of family members in cognitive intervention programmes could be key. However, it has been argued that the WISC

measure is an insensitive measure at detecting the specific neuropsychological vulnerabilities that occur following brain injury [51] and future research should perhaps extend or supplement this measure of intellectual ability. What appears apparent from the literature is the need for interventions to be relatively intensive, with cognitive training sessions taking place daily or more than twice a week. In conclusion, it appears that there are a small number of good quality studies highlighting the effectiveness of neuropsychological training in terms of attention and memory difficulties in children with ABI.

### Cognitive - Future Research

Drawing on the available evidence, it is difficult to determine if post intervention gains in attention skills generalise beyond the clinical setting, due to a lack of measures examining the effects in school performance or behaviour at home. Future research should aim to assess the generalisability of the cognitive improvements in terms of a child's everyday life. More research is needed to determine the 'active ingredients' of the interventions that are most effective, and also in terms of matching interventions according to individual child and family characteristics. There is a need for further good quality studies including the use of RCT's that control for confounding factors, such as time spent with therapist. From the studies reviewed above, only one investigated if improvements in cognitive outcomes were sustained at 6 months post intervention [45]. Again, more research is needed to ascertain longer-term maintenance of functional gains. Studies by Brett and Laatsch [48] and Braga et al [49] are encouraging as they found positive outcomes in programmes implemented in the school and home settings. More research is needed looking at the efficiency of cognitive intervention programmes

administered by family members or educational staff. This may follow training and supervision from clinicians / therapists and may prove to be a cost-effective method of administration. The paediatric ABI population is heterogeneous and more research is needed to look at interventions for specific diagnostic groups, as well as injury severity, as this may have an impact on the effectiveness of interventions.

### Psychosocial – Main Outcomes

In terms of interventions for psychosocial outcomes, there are some encouraging findings, with the key outcomes relating to improvements in internalising symptoms, such as depression/anxiety and withdrawal, with medium effect sizes being observed [39 & 40]. Medium effects were also found in terms of parent-child interactions and parental adjustment [40]. Medium effect sizes were observed for child adjustment [19 & 41]; however, it is difficult to attribute these positive changes to the intervention itself, as there was no control or comparison groups in this study. When considering which factors may impact on the effectiveness of these interventions, it appears that children of lower socio-economic status and children with a TBI aged over 11 years may benefit most from online family interventions [40]. In terms of psychosocial outcomes there is a key role for families to play in being involved in interventions. The literature in this domain is more advanced than for cognitive outcomes, with three out of the four studies involving the family in the intervention.

### Psychosocial – Future Research

A criticism that can be made of Wade and colleagues work [19, 39, 40 & 41] with the whole family, is that the child's reports and views can become lost as most data were



collected from parent reports. While important, if parent opinions are the main focus of outcomes measures, conclusions are limited in terms of the clinical impact that the intervention has on a child's day-to-day life. There is also evidence of large discrepancies between parent proxy and child reports on quality of life measures; this led Theunissen et al [52] to conclude that parent reports often cannot be substituted for child reports. There is therefore a need for research to include child report measures and teacher rated measures to gain a more holistic perspective.

Overall, more research is needed with other treatment comparison groups and with larger sample sizes. The psychosocial outcomes above also relate mostly to childhood TBI, as only one of the total 82 participants over the four studies had an ABI. More research with different diagnostic groups is needed, to ascertain the generalisability of results.

#### Strengths / Limitations and Future Directions

This is the first systematic review of its kind that focuses specifically on the post-acute-recovery phase, as this is a time when there appears to be less support, yet a high need for support as the potential for the gap between ABI children and their non-injured peers widens [7]. Other reviews in the area have either been practitioner reviews or have focussed on less methodologically high quality studies.

Cognition is a complex area that encompasses several domains (attention, memory, general intellect, executive functioning, perception, language). As there is a lack of methodologically high quality studies in the area of paediatric ABI, this review grouped cognitive domains together. As the evidence base develops further, this will allow more valid stratification and analysis of specific cognitive domains. It also appears that most

of the studies use a wide age range, often covering the whole school range, research that tailors intervention for specific age ranges would be of real interest to practitioners. This may be particularly important in terms of early intervention for younger children to maximise their developmental trajectory and avoid them “growing into” their deficits in adolescence. Also, time since injury ranged from 4 months to 16 years in the studies reviewed and it may be useful to explore the impact of time since injury regarding optimum effects of the intervention.

### Conclusions and Practical Applications

In conclusion, there were some encouraging results obtained from the above studies, mainly in terms of effective interventions for alleviating attentional and internalising symptoms, which may be beneficial for professionals working with paediatric ABI. However, better controlled research with larger sample sizes is needed. Further research that captures the views of the children and teacher as well as parents views and captures the clinical significance of improvements is needed to make strong recommendations for service provision. The adoption of multi-centre collaboration may allow for the above methodological concerns to be addressed.

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(\* = *included studies*)

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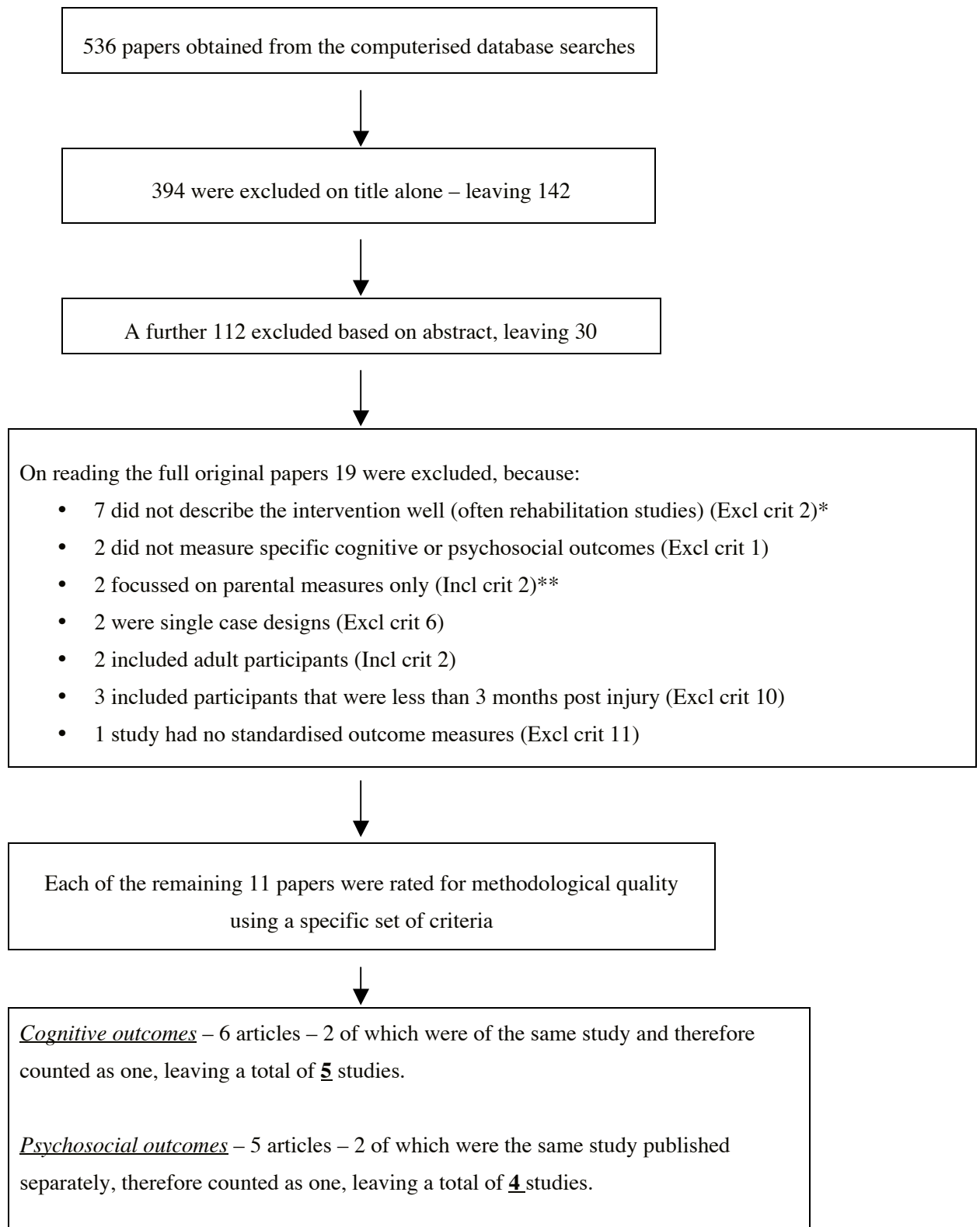
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Table 1 – Flow diagram of papers excluded at each search stage:



(\*Excl crit = Exclusion Criteria, \*\*Incl crit = Inclusion criteria)

Table 2: Description and Methodological Quality Ratings of Included Studies – Cognitive Outcomes

Study and Quality Rating	Description of intervention	Sample	Cognitive Outcome Measures	Effect Sizes	Findings
[46] Galbiati et al (2009)  85% High	Group comparison study. Had a control group but not randomly assigned. One group received attention-specific neuropsychological training for 6 months; the control group did not receive treatment.	n=65 children with attentional problems following severe TBI. (n=40 treatment group and n=25 controls)  Aged 6-18 years. 6-10 months post injury.	<u>Intellectual functioning</u> WISC-R or WAIS-R <u>Attention</u> Continuous performance test II	<u>Intellectual functioning</u> g=0.1,small  <u>Attention</u> g=1.35,large	At follow up, the treatment group showed significantly more improvement in terms of attention. No significant differences in intellectual functioning.
[44 & 45] Van't Hoof et al (2005 / 2007)  73% Moderate	RCT. Cognitive training programme (AMAT-c) administered by teachers or parents for 30 minutes per day for 17 weeks with once weekly contact from therapist. Control group had an interactive activity for the same time. Six month follow-up study (2007).	n=38 children with attentional and memory deficits following ABI.  Aged 9-17 years.  1-5 years post injury.  Mild, moderate and severe TBI, encephalitis, anoxia, brain malignancies.	<u>Attention</u> Visual and Auditory - Reaction Time Tests GDS Stroop Test. Binary Choice Test Coding Trail Making Test <u>Memory</u> Digit Span Test 15-Word Test Rey-Osterrieth Complex Figure recall. Rivermead Behavioural Memory Test.	Effect sizes could not be calculated	The cognitive training group showed improved complex attention and memory functions. These improvements were sustained at 6 months post intervention.
[47] Sjo et al (2010)  35% Low	Before and after trial no control group. Looked at the feasibility of the AMAT-c programme being integrated into the school setting.	n=7 children with ABI (no information on severity) Aged 8-16 years.  10 months-8 years post injury.	<u>Attention / Executive Functioning</u> TEACH BRIEF  <u>Learning and Memory</u> WISC-II	<u>Attention / Executive Functioning</u> Overall g=0.34,small  <u>Learning and Memory</u> Overall g=0.58, medium	Significant improvements in terms of learning and memory.

(\* Effect sizes: g = 0–0.5 small, g = 0.5-0.8 medium, g > 0.8 large)

<p>[48] Brett and Laatsch (1998)</p> <p>54% Moderate</p>	<p>Before and after trial no control group to assess the effectiveness of a school individualised cognitive rehabilitation programme that focussed on: 1) alertness, attention and concentration, 2) perception and memory, 3) executive processes.</p>	<p>n=10 high school student with ABI (no mention of severity). All were 1-16 years post injury.</p>	<p><u>Attention</u> Benton Visual Form Discrimination Test Stroop Test</p> <p><u>Intellectual Functioning</u> TONI-2 WISC-IV (Picture completion and Freedom from distractibility)</p> <p><u>Memory</u> Wide Range Assessment of Memory and Learning</p> <p><u>Problem Solving</u> Tower of London Test Wisconsin Card Sorting Test</p>	<p><u>Attention</u> Overall g=0.45, small-medium</p> <p><u>Intellectual Functioning</u> Overall g=0.42, small</p> <p><u>Memory</u> Overall g=1.02, large</p> <p><u>Problem Solving</u> Overall g=0.16, small</p>	<p>After treatment, students demonstrated significant improvements in general memory ability.</p>
<p>[49] Braga et al (2005)</p> <p>73% Moderate</p>	<p>RCT. Two groups - clinician-delivered or family-supported intervention (SARAH). Both groups received one year of intensive individualised rehabilitation. Aims to determine if parents can be trained to effectively deliver rehabilitation exercises to improve physical and cognitive outcomes.</p>	<p>87 children who had sustained a moderate to severe TBI.</p> <p>Aged 5-12 years.</p> <p>6-30 months post injury.</p>	<p><u>Intellectual Functioning</u> WISC-III</p>	<p>Clinician delivered group overall g=0.18, small</p> <p>Family supported group overall g=0.66, medium</p>	<p>Children in the family-supported treatment group experiences superior cognitive outcomes than the direct clinician lead treatment group. Improvements were statistically and clinically substantial.</p>

\*See Appendices for full titles and information on outcomes measures.

Table 3: Description and Methodological Quality Ratings of Included Studies – Psychosocial Outcomes

Study and Quality Rating	Description of intervention	Sample	Psychosocial Outcome Measures	Effect Sizes	Findings
[39] Wade et al (2006) (1)  77% High	RCT. Investigated a 14 session online CBT family problem solving intervention, providing training in problem solving, communication and behaviour management and meetings. Therapist meeting every 2 weeks. Internet resource control group. Families continued to receive any psychosocial care they were receiving.	n=39 families of children who had sustained a moderate to severe TBI.  Aged 8-13 years. 6-19 months post injury.	<u>Child adjustment</u> CBCL HCSBS	<u>CBCL</u> Total g=0.24, small Internalising g=0.45, small-medium Externalising g=0.01, small  <u>HCSBS</u> Social competence and antisocial behaviour overall g=0.42, small	The treatment group reported better child self-management/compliance at follow-up. Overall effect sizes large for children of lower SES and children older than 11 years.
[40] Wade et al (2006) (2)  73% Moderate	RCT. Studied the efficacy of a 7 session manualised family-centred problem-solving intervention, delivered over 6-months to participating families. Intervention focussed on a 5-step process: Aim, Brainstorm, Choose, Do it and Evaluate, usual care control group. Families continued to receive any therapy they were receiving.	n=32 families of children aged 5-16 years who had sustained a moderate to severe TBI.  All children were 4-12 months post-injury.	<u>Child behaviour</u> CBCL  <u>Parental adjustment</u> BSI-GSI  <u>Parent-Child Interaction</u> CBQ	<u>CBCL</u> Total g=0.12, small Internalising g=0.72, medium Externalising g=0.04, small <u>Parent adjustment</u> Overall g=0.55, medium <u>Parent-Child interaction</u> Overall g=0.51, medium	In the treatment group, there were significant reductions in child behaviour problems; particularly internalising symptoms. No significant differences in terms of parent-child conflict.
[19 & 41] Wade et al (2005) (1)  73% Moderate  (2005) (2)  58% Moderate	Before and after trial (no control group) to assess the feasibility and preliminary efficacy for an online Family Problem Solving treatment. The intervention addresses cognitive appraisals, coping and family communication through self-guided web pages and one-to-one videoconference sessions with a trained therapist.	n=6 families with a child who had sustained a moderate to severe TBI more than 15 months previously.  Aged 5-16 years.	<u>Child-adjustment</u> BRIEF HCSBS  <u>Parent-child interaction</u> IBQ PARQ (school conflict scale)  <u>Family functioning</u> FAD - GF  <u>Parent adjustment</u> FBII PSI GSISC Anxiety Inventory Centre for Epidemiological Studies Depression Scale	<u>Child-adjustment</u> Overall g=0.64, medium <u>Parent-child interaction</u> Overall g=0.44, small <u>Family Functioning</u> Overall g=0.15, small <u>Parent adjustment</u> Overall g=0.83, high	Improvements in antisocial behaviours, and reductions in conflict with parents regarding school issues but no improvement in self-reported depressive symptoms.

<p>[50] Wiseman-Hakes et al (1998)</p> <p>42% Low</p>	<p>Before and after trial (no control group). Evaluation of an intervention programme for treating adolescents with pragmatic communication deficits secondary to ABI. The programme ran for 6 weeks, 4 days per week, for one hour each day, the intervention focussed on four main modules: initiation conversation, topic maintenance, turn taking and active listening.</p>	<p>n=6 children aged 14-17 years with ABI and pragmatic deficits and subsequent difficulties in social interaction.</p> <p>3 months - 9 years post injury.</p>	<p><u>Pragmatic Skills</u> RICE-RSPCS CPS</p> <p><u>Behaviour</u> VABS -socialisation</p>	<p><u>RICE-RSPCS</u> g=1.91, large</p> <p><u>CPS</u> g=0.72, large</p> <p><u>VABS</u> (socialisation) g=0.24, small</p>	<p>Significant group changes in the RICE-RSPCS and CPS measures. No statistically significant difference in VABS socialisation domain score.</p>
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\*See Appendices for full titles and information on outcomes measures.

## CHAPTER TWO: MAJOR RESEARCH PROJECT PAPER

### **Friendship and psychosocial functioning in children who have sustained a traumatic brain injury**

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**Abstract:**

*Objective:* Traumatic brain injury (TBI) in children has previously been associated with theory of mind deficits and social problem solving difficulties; potentially interfering with psychosocial development and friendships. This study aimed to investigate if friendship quality, rates of loneliness and general psychosocial functioning are different in children who have sustained a traumatic brain injury (TBI) compared to non-injured controls. *Design:* A between subjects design with 14 participants in the TBI group and 14 in the non-injured control group, all aged between 7 and 13 years. The groups were matched for gender and were similar in age and socio-economic status. *Methods:* There were 5 outcome measures. Three were completed by children relating to receptive vocabulary (BPVS II), friendship quality (FQQ-R) and rates of loneliness (LSDS). Two were completed by the main caregiver measuring social skills deficits and social withdrawal (PIC-2) and general psychosocial and behavioural functioning (SDQ).

*Outcome and Results:* The TBI group had more severe difficulties in hyperactivity ( $z = -3.5, p < 0.001$ ) and emotional symptoms ( $z = -2.4, p < 0.05$ ) than their non-injured peers. No significant differences were observed on measures of friendship quality; however, a larger percentage of the TBI group fell within the abnormal or borderline range in terms of peer problems. *Conclusions:* Whilst finding evidence of vulnerability in hyperactivity, emotional symptoms and conduct problems, evidence for friendship problems were not found in children following TBI. There is a need for prospective longitudinal research to explore the complex relationship between TBI and poorer social outcomes that are often apparent in adolescence.

*Keywords:* traumatic brain injury, paediatric, pediatric, social, friendship



## **Introduction**

Childhood and adolescence is a time of rapid social and emotional development, when social interaction skills and friendships are of particular importance for emotional welfare and self-esteem [1]. Traumatic brain injury (TBI) in childhood can have a significant detrimental impact on socio-emotional factors in terms of friendships [2], loneliness [3] and general psychosocial functioning and quality of life [4].

‘Theory of mind’ (ToM) describes an individual’s awareness of their own and others’ mental states including their feelings, beliefs and desires. Baron-Cohen et al [5] revolutionised autism research with the theory that deficits in ToM account for impairments in social skills, in particular, impairments in social reciprocity and communication. Snodgrass and Knott [6] found evidence to suggest deficits in advanced ToM tests and emotional recognition skills in children who had sustained a TBI, particularly in the frontal brain regions. They highlight the need to further investigate socio-emotional functions following paediatric TBI. There is evidence of deficits in social problem solving skills in children with TBI compared to orthopedic controls [7]. Janusz et al [8] suggest that these may account for poor social outcomes and highlight the need for more research examining friendships and peer relationship outcomes following childhood TBI. Tonks et al [9] found that children with severe acquired brain injury performed less well at reading emotions than age matched controls and these difficulties were unrelated to cognitive outcomes. They also found

evidence of a relationship between emotion recognition ability and socio-emotional behavioural outcomes. They recommend that researchers focus on developing a more thorough understanding of socio-emotional deficits post ABI so that vulnerabilities can be targeted for intervention. Turkstra et al [10] found that adolescents with a brain injury performed significantly poorer than healthy controls in an emotion recognition task and in a task that tested their ability to detect social conversational skills. It may be that these difficulties in theory of mind, emotion recognition and social problem solving have a negative impact on social skills, general psychosocial functioning and moreover friendship quality in children with TBI.

In a longitudinal study of children with mild, moderate or severe brain injury, Fletcher et al [11] found that more severely injured children engaged in fewer social activities. More recently, Prigatano and Gupta [2] studied friendship in TBI children and adolescents aged 7-14 years, and found that in the control group 75% had 4 or more friends but only 39% of children with mild, 20% of children with moderate and 14% of children with severe TBI had 4 or more friends. There is a lack of research looking directly at friendship quality in children who have sustained moderate to severe TBI, for example, children's perception of their relationship with their peers, their perception of how much conflict there is in their relationships and how much prosocial behaviour such as sharing occurs in their friendships. Much of the research has focused on the specifics of peer relationships, such as how many friends the child has. There is even less evidence that considers the child's perspective [8]. Bohnert et al [12] is one of few that have investigated friendship quality in children with TBI,

finding that parents perceived their child as experiencing more problematic peer relationships. They also found that children with more severe TBI had greater difficulty managing conflict and had less intimacy in their friendships. Their sample included children with mild TBI and further research into the effects of more severe TBI is warranted. Andrews et al [3] also investigated the social and behavioural effects of TBI in children. They found that the TBI group had lower levels of self-esteem and higher levels of loneliness than non-injured peers.

The impact that age at injury can have on psychosocial factors has also been a neglected area of research. Historically it was believed that the earlier the age at injury the better the prognosis [13]. However, there is now evidence to suggest that injury earlier in life in children increases the risk of developing global problems because areas of the brain that are developing most rapidly are most vulnerable to damage [14]. Children with a traumatic brain injury are more at risk than adults for persisting effects and moreover, the younger the child is at injury the more profound the impact on development [15]. Anderson and Moore [16] studied children who had sustained a head injury before or after the age of 7 years. Children who had sustained the injury before 7 years performed more poorly on cognitive tasks at two year follow up than those sustaining the injury later in childhood. They felt that further investigation of the impact of age at injury would be useful.

It seems evident that TBI can have a detrimental effect on psychosocial functioning. More severe injuries seem to be associated with a more detrimental effect. However,

research to date concludes that our understanding of socio-emotional outcomes is limited. The present study investigates the quality of friendships, degree of loneliness and psychosocial functioning more generally in children with moderate or severe brain injury compared to a non-injured control group.

Hypotheses:

- 1) The TBI (traumatic brain injury) group will rate the quality of their friendships as poorer than controls on the Friendship Quality Questionnaire Revised (FQQ-R).
  
- 2) Parents of children who have sustained a TBI will rate their child's friendship quality as poorer than parents of controls on the Personality Inventory for Children 2<sup>nd</sup> Edition (PIC-2).
  
- 3) Children with TBI will have higher scores on the Loneliness and Social Dissatisfaction Scale (LSDS).
  
- 4) Parents of children who have sustained a TBI will rate more difficulties in peer problems, conduct problems, hyperactivity, emotional problems and prosocial behaviour than parents of controls on the Strengths and Difficulties Questionnaire (SDQ).

If significant differences are found, post-hoc analyses will be carried out to determine whether factors such as injury severity, age at injury or time since injury are associated with these differences.

## **Methods**

### *Design*

Ethics approval was obtained from West of Scotland Ethics Committee. A between group design was used to compare measures of friendship quality, loneliness and general psychosocial functioning in children who had sustained a TBI with non-injured controls who were matched for gender and of a similar age. The independent variable is group (i.e. TBI or control). Dependent variables are scores on self-report and parental questionnaires that relate to the child's friendship quality, loneliness and general psychosocial functioning.

### *Power Calculation*

There is little research looking at psychosocial functioning or friendship quality in children with TBI. Studies of related constructs were therefore used to estimate sample size needed to obtain power of 0.8 at an alpha of 0.05 prior to commencing the study. Tonks et al [9] measured emotional recognition in children who had sustained a moderate to severe TBI and Snodgrass and Knott [6] measured emotional recognition and theory of mind in a similar sample, both studies also utilised a non-injured control group. These studies were used here, as it was hypothesised that theory of mind and emotional recognition deficits could have a direct impact on a child's friendship quality and general psychosocial functioning and there is a lack of research directly measuring friendship quality in children who have sustained a TBI. Cunningham et al [17] measured friendship quality in children with neurological conditions using the FQQ-R; it was hypothesised that this group may have similar characteristics to the TBI population.

Effect sizes were calculated for all three studies and were found to be medium to large ( $d = 0.7 - 0.9$ ). Power calculations were conducted using G\*Power online power calculator and indicated that a minimum of 18 children in each group (TBI and Control) would be required for power of 0.8 at an alpha of 0.05 with these effect sizes.

### *Participants*

Twenty-eight children aged between 7 and 13 years participated in the study. Fourteen of these children (10 males and 4 females) had sustained a TBI. Twelve of the TBI group were recruited from UK regional neuroscience units or a neurosurgery service (Royal Hospital for Sick Children and Southern General Hospital, Glasgow ( $n=8$ ) and Newcastle General Hospital ( $n=4$ )). The remaining two TBI participants were recruited from a national UK charity CBIT (the Child Brain Injury Trust). All children in the TBI group had sustained a moderate or severe TBI between 6 months and 6.4 years before participating (mean = 2.9, median = 2.7) and age at injury ranged from 3.5 years to 12 years (mean = 8.4, median = 8.25). The lowest pre-resuscitation Glasgow Coma Scale scores were available for 12 children; 5 were severe ( $GCS \leq 8$ ) and 6 had a moderate TBI ( $GCS = 9 - 12$ ). One participant had a GCS of 15 (mild), however, this was recorded on admission to hospital as opposed to in the field and there were reports of loss of consciousness at the scene and the mechanism of injury was suggestive of a high-energy transfer. This participant was ventilated on admission to hospital and had a positive imaging result and was therefore included in the study. Where GCS was not available ( $n=2$ ), severity of injury was determined by interviewing parents. The parents reported that they witnessed a loss of consciousness and unresponsiveness, both children were

ventilated on admission to hospital and CT scans revealed intracranial bleeding and swelling of the brain. Both were sedated for two or more days in hospital and were disorientated for 24 hours or more. Both were admitted to hospital for between 5 and 10 days. These factors suggest that a severe TBI was sustained [18]. Parental reports and medical records verified that no children included in the study had a premorbid history of learning disability, developmental disorder, penetrating head injury or severe premorbid behavioural problems. The British Picture Vocabulary Scale II [19] was administered to ensure that receptive vocabulary skills were at or above the 7-year cut off point (the minimum age needed to understand the questionnaires) for all participants. Table 1 shows the characteristics of the TBI group.

*{Insert Table 1 about here}*

Fourteen non-injured children were recruited as controls from mainstream Primary and Secondary schools chosen at random in the West of Scotland. Due to large differences in friendships at developmental stages, it was essential that participants were gender matched and showed a similar distribution in terms of age to the TBI group (See table 3).

The Scottish Index of Multiple Deprivation 2009 (SIMD) [20] is a measure of deprivation based on the proportion of the population in receipt of income-related benefits in 2005, as well as children dependent on adult recipients of those benefits. The scale was developed from the Scottish Government and is based on 7 domains (income, employment, health, education, skills and training, housing, geographical access and

crime). The SIMD is presented at a datazone level, which estimates deprivation in small geographical areas across Scotland. SIMD scores range from 1 (being the most deprived datazone) to 6,505 (being the least deprived). SIMD scores were obtained from the SIMD website for all but four of the participants (those residing in England). The Indices of Multiple Deprivation (IMD) 2007 [21] provides a measure of deprivation in England that is based on the same categories as SIMD (employment, health and disability, education, skills and training, barriers to housing and services, living environment and crime). Like the SIMD, the English IMD 2007 provides a deprivation ranking for small geographical areas. However, given the larger geographical area, the English IMD scores range from 1 (most deprived area) to 32,482 (least deprived). Deciles for both the SIMD and English IMD can be calculated, whereby the datazones (6,505 for SIMD and 32,482 for English IMD) are classified into 10 sub-groups (1=most deprived, 10=least deprived) (see table 2). The distribution was similar with the inclusion or exclusion of English participants (See Appendices for the distribution in graphical form). Over half (64%) of the total sample in this study fell into the three most deprived deciles. A deprivation percentage was calculated for each participant, this was calculated as the participants SIMD or English IMD score divided by the whole range (6,505 for Scottish participants and 32,482 for English participants). This provides a measure of deprivation that is more sensitive than decile categories. Table 3 provides demographic information of both TBI and control participants.

*{Insert Table 2 about here}*



*{Insert Table 3 about here}*

### *Procedure*

Informed consent was gained from parents and children before participating in the study. Children completed the BPVS-II and two questionnaires with the investigator. These were administered in a quiet room in the child's home or in a hospital setting for the TBI group and in a quiet space in the school setting for the control group and required between 30 and 50 minutes to complete. Parents were issued with two questionnaires, which required up to 30 minutes to complete.

### *Measures*

Initially parents were asked for information on cause, type and severity of injury. Questions were also asked regarding the exclusion criteria for both TBI and control groups.

There were three measures for children to complete:

#### British Picture Vocabulary Scale II (BPVS II) [19]

This is a measure of receptive vocabulary for Standard English and takes around 5 – 8 minutes to complete. It is administered individually for children aged 3 years to 15 years and provides norm-referenced scores. The test is assumed to have good reliability and validity as it is based on the BPVS (initial edition), which has been shown to have good reliability and validity [22 & 23].

### Friendship Quality Questionnaire – Revised [24]

This measure was designed for children in Grades 3-6. It is a 41-item questionnaire that takes around 40 minutes to complete. Children are asked to indicate on a 5-point scale how true a particular quality is of their friendship with a particular friend (i.e. 0-not at all, 1-a little true, 2-somewhat true, 3-pretty true, 4-really true). The items are then divided into 6 subscales: Validation and Caring – the degree to which the relationship is characterised by caring, support and interest, Conflict and Betrayal – the extent to which the relationship is characterised by argument, disagreement, annoyance and mistrust, Companionship and Recreation – the extent to which friend’s spend most enjoyable time together inside and outside school, Help and Guidance – The extent of friend’s efforts to assist one another with routine or challenging tasks, Intimate Exchange – Extent to which relationship is characterised by disclosure of personal information and feelings, Conflict Resolution – Degree to which disagreements in the relationship are resolved efficiently and fairly. Scores for each of the 6 subscales are determined as the mean score of the relevant items. The psychometric properties of this measure are well established and it has been shown to have good reliability and validity [24].

### Loneliness and Social Dissatisfaction Scale (LSDS) [25]

This is a 24-item self-report measure designed to measure the extent to which children feel lonely or socially dissatisfied in a school setting. The questionnaire includes 16 items that measure loneliness and 8 filler items. Children respond to each item on a 3-point scale (no=0, sometimes=1, or yes=2). A sum of the 16 items is produced, with

reverse scoring where necessary. Scores therefore range from 0 to 32. This measure has been shown to have excellent internal consistency [26].

There were two measures completed by the main care giver (parents):

Personality Inventory for Children – 2<sup>nd</sup> edition (PIC-2) [27]

The PIC-2 is considered to be a good measure of psychosocial functioning across a number of domains that has been shown to have reliability and validity within the acceptable ranges [28]. The Behavioural Summary is a standardised abbreviated version of the PIC-2 Standard Form was utilised. For the purposes of this study only the following scales of the Behavioural Summary will be used, the Social Skills Deficits (SSK) and Social Withdrawal (WDL) as they theoretically relate to the construct of friendship quality. The SSK scale has 12 items and is a measure of limited social influence and problematic peer relations. The WDL also has 12 items and is a measure of social discomfort and withdrawal. The scales are computed by summing a raw score, which is compared with normative data for gender. A T-score is then determined.

Strengths and Difficulties Questionnaire (SDQ) [29]

This is a worldwide well-used 25-item measure of general psychosocial functioning across five domains: hyperactivity, peer problems, emotional symptoms, conduct problems and pro-social behaviour. A total difficulties summary score is also calculated, which is the sum of the four difficulty scores (hyperactivity, peer problems, conduct problems and emotional symptoms). Parents indicate how true particular traits are of their child (i.e. not true, somewhat true, certainly true). Each subscale has a clinical cut-

off point; these are designed so that 80% of the population score within the average range, 10% within the borderline range and 10% of the population fall within the abnormal range. This measure has been shown to have good reliability and validity [30].

## **Results**

### *Demographic Variables*

The TBI and control groups were the same in terms of gender (10 males and 4 females in each group). For other variables, frequencies were plotted and inspected for normality of distribution and skewness and standard error measurements were calculated. These analyses suggest that parametric tests were appropriate for measures of age and BPVS II scores data but not for deprivation. Independent-samples t-tests indicated no significant difference between TBI and control groups for age ( $t(26) = 0.77, p = 0.5$ ) or receptive vocabulary (BPVS II standardised scores:  $t(26) = 1.32, p = 0.2$ ). In terms of deprivation, a percentage was calculated from individual English IMD or SIMD scores for each participant divided by the whole deprivation range (SIMD = 6505, IMD = 32,482), which allowed for inclusion of both English and Scottish participants. Using these percentages for each participant, a Mann-Whitney U test revealed no significant difference between groups in terms of deprivation ( $U(26) = 85, z = -0.6, p = 0.55$ ); (See Table 3).

### *Between Group Analyses*

Frequency data were plotted for each of the four main outcomes measures to consider the normality of the data. Skewness and standard error measurements were also carried out. Based on the fact that the data were ordinal and the results of the above analyses, non-

parametric tests were used. Medians, ranges and effect sizes for each of the four outcome measures are presented in Table 4.

Mann-Whitney U tests were conducted to evaluate the hypotheses that the TBI group would have poorer scores on measures of friendship quality (as measured by the FQQ-R and PIC-2), loneliness (as measured by the LSDQ) and general psychosocial functioning (as measured by the SDQ).

The results were non-significant for the six measures in the Friendship Quality Questionnaire – Revised (FQQ-R): validation and caring (Mann Whitney  $U(26) = 93$ ,  $z = 0.23$ ,  $p = 0.8$ ), conflict and betrayal ( $U(26) = 85$ ,  $z = 0.6$ ,  $p = 0.5$ ), companionship and recreation ( $U(26) = 96.5$ ,  $z = 0.7$ ,  $p = 0.9$ ), help and guidance ( $U(26) = 86.5$ ,  $z = 0.5$ ,  $p = 0.6$ ), intimate exchange ( $U(26) = 86.5$ ,  $z = 0.5$ ,  $p = 0.6$ ) and conflict resolution ( $U(26) = 96.5$ ,  $z = 0.7$ ,  $p = 0.9$ ). For the LSDS, there were no significant differences between the groups ( $U(26) = 79.5$ ,  $z = 0.6$ ,  $p = 0.5$ ).

Parent / carer ratings using the PIC-2 were also non-significant for social skills deficit (SSK) ( $U(26) = 85$ ,  $z = 0.6$ ,  $p = 0.5$ ) and social withdrawal (WDL) ( $U(26) = 80.5$ ,  $z = 0.8$ ,  $p = 0.4$ ) were non-significant. For the parent / carer ratings of general psychosocial difficulties (SDQ), the results were significant and in the predicted direction for total difficulties ( $U(26)$ ,  $z = -2.6$ ,  $p = 0.009$ ). There were no significant differences between groups on the peer problems measure ( $U(26) = 81.5$ ,  $z = 0.8$ ,  $p = 0.4$ ), the conduct problems measure ( $U(26) = 60$ ,  $z = 1.8$ ,  $p = 0.07$ ) or the prosocial behaviour scale ( $U(26) = 98$ ,  $z = 0.000$ ,  $p = 1.0$ ) of the SDQ; the TBI group reported greater difficulties on the hyperactivity ( $U(26) = 23.5$ ,  $z = -3.5$ ,  $p < .001$ ), and emotional difficulties ( $U(26) = 24$ ,  $z = -2.4$ ,  $p < 0.05$ ) scales.

Effect sizes were calculated for all four outcome measures by dividing the z-score by the square root of the sample size ( $n$ ) [31]. Small effects were found for measures of friendship quality, loneliness, social skills deficit and social withdrawal. Large effects were found on SDQ measures of total difficulties and hyperactivity and medium effect sizes for emotional symptoms and conduct problems (see Table 4).

*{Insert Table 4 about here}*

As the SDQ showed some significant results, the percentage of children who fell into the normal, borderline and abnormal ranges in each group for each of the SDQ summary scores is presented (see Table 5). Difficulty summary scores (emotional symptoms, conduct problems, hyperactivity and peer problems) showed a higher percentage of children with TBI in the abnormal range than control children. For hyperactivity, 43% more children with TBI fell in the abnormal ranges. For conduct problems, 36% more children with TBI fell outwith the normal range than control children.

*{Insert Table 5 about here}*

#### *Within Group Analyses*

As the SDQ measure showed significant differences from the control group in terms of total difficulties, hyperactivity and emotional problems, post-hoc analyses were conducted to determine if there was a relationship between age at injury, time since injury or injury severity (as measured by the GCS) and these measures that were significant. Kendall's tau correlation coefficients for ranked data revealed no significant

relationships between age at injury, time since injury or severity of TBI and hyperactivity or emotional problems (see Table 6).

*{Insert Table 6 about here}*

## **Discussion**

### *Main Findings*

The present study provides evidence that children who have experienced a TBI have more severe difficulties in terms of hyperactivity / attentional difficulties and emotional symptoms (SDQ) than their non-injured peers, with medium to large effect sizes being observed. It is noteworthy that the significant differences were observed even in a small sample of children with a range of injury specifications (i.e. mechanism of injury, time since injury etc). The results suggest that variables such as age at injury, injury severity or time since injury do not affect the severity of hyperactivity or emotional symptoms in this TBI sample. There is evidence of children with TBI having greater difficulties in terms of conduct problems, although this did not reach significance. Contrary to our hypothesis, the results suggest that children aged between 7 and 13 years who have sustained a TBI do not experience friendship, loneliness or social difficulties. This was consistent across child and parent / carer perspectives (FQQ-R, LSDS, PIC-2). Small effect sizes were observed for friendship and social measures suggesting that even if a larger sample size had been utilised, it would be unlikely that this would affect the significance of the results.

### *Previous Literature*

The present study found similar results to Limond et al [4] in percentages of children with TBI falling out with the normal range (i.e. borderline or abnormal ranges) on SDQ difficulty scores (emotional symptoms 34% compared to 36%, conduct problems 31% compared to 43%, hyperactivity 40% compared to 50%, peer problems 38% compared to 21%). The present study's finding in terms of attentional vulnerability is consistent with previous literature that suggests paediatric TBI commonly results in inattentiveness, restlessness and impulsivity. For example, Schachar et al [32] found that the development of attention deficit hyperactivity disorder (ADHD) symptoms were three times more likely in children with a TBI than in controls, even when premorbid symptoms were controlled for. In the current study, there was no evidence of injury severity, time since injury or age at injury having an impact on these scores. Previous research has suggested that younger age at injury and more severe injuries have a more detrimental affect on a child's functioning [15 & 12]. However, it is important to note that the TBI sample in this study represents a group with more severe injuries than previous literature, which often includes a mild TBI group. The sample size is also small and may have affected the significance of these results.

Previous literature provides evidence of theory of mind [6], emotion recognition [9] and social problem solving [8] difficulties following paediatric TBI and it was hypothesised that these difficulties could impact on a child's friendship quality and social experiences. Contrary to this, the results of the present study suggest that these deficits do not negatively impact on social experiences in this age group. The non-significant finding in terms of friendship quality is consistent with previous findings [12]. However, it is



important to be mindful of the measures used. The FQQ-R was used in the current study and Bohnert's [12], this measure relates only to the child's closest friendship and it may be that this relationship is more robust and does not measure more subtle social vulnerabilities in this population.

It is also noteworthy that previous studies that report social vulnerabilities following childhood TBI [8 & 9] included older children in their sample (up to 17 or 18 years) than did the present study. Hence there may be an age or time since injury effect not captured within the age range (7 – 13 years) or time since injury (6m - 6.5yr) of the present study. It is now recognised that unlike adults who have sustained a brain injury, children's brain areas are still developing and the consequences of their injuries may not become apparent until later life when social interactions require more complex solutions [33]. In the prefrontal cortex in particular, impairments may not become apparent into early adulthood [9]. Children who have experienced a TBI can appear functionally intact post-injury, but may fail to 'keep up' when their non-injured peers mature. It has been argued that difficulties following paediatric TBI can lie dormant for many years and it is often when environmental demands become more complex, combined with a failure in expected functional maturation, that difficulties emerge [33]. This is particularly evident in adolescence when there is a need for the development of more sophisticated social communication skills [33] and transitional periods such as moving from primary school to secondary school can also be particularly troublesome for this population [34]. It has been argued that that children with ABI may "grow into" their deficits in adolescence or early adulthood [18]. This may be particularly important here, as the children in this sample were aged between 7 and 13 years, therefore representing a younger age group

than in previous studies and most of the sample did not fall into the adolescent age bracket. Therefore it appears that there are more protective factors in early childhood, when social relationships are less complex and the child is often in a smaller, more supportive educational environment in primary school. This may account for the non-significant finding in terms of friendships and social functioning in this younger TBI sample.

### *Strengths / Limitations*

A key strength of the current study is that the control group was similar in terms of age, gender and socio-economic status, which allows for better comparisons between the groups. This study is also one of few that considered the child's perspective as well as parents / carers. The sample size is modest and did not meet the predicted numbers based on the power calculation; however, significant difficulties were found in measures of hyperactivity and emotional symptoms, with large effect sizes observed. The TBI sample was a small heterogeneous sample with a wide-ranging age at injury and time since injury, this makes assessment of the influence of these factors on psychosocial functioning difficult.

There were some limitations to the measures used. Some of the child completed questionnaires asked very similar questions. There is evidence that children often change their responses if they are repeatedly asked similar questions and it has been hypothesised that they may assume that their initial response was incorrect [35 & 36]. Therefore, this may introduce some bias to the results. Also due to time limitations, there were no observer ratings or teacher ratings of friendship quality. There is now evidence of poor

relationships between children's perceptions of their friendships and the reality of observational measures, with young children often underreporting friendship difficulties compared to observational measures [37]. Therefore, the present results may underrepresent social difficulties in this sample by relying solely on child and parent reports. Due to time limitations, there was no scope to include a later follow up, to assess whether friendship and social difficulties emerge at a later developmental stage. Measures of premorbid psychosocial functioning were not available for the sample and while this study attempted to control for this by use of exclusion criteria, it is difficult to ascertain if vulnerabilities in terms of hyperactivity and emotional symptoms were present prior to the TBI.

### *Practical Applications*

Rehabilitation is often not provided after the acute recovery following TBI, especially if there is no persisting physical disability [38]. In the present TBI sample, 79% were more than a year post injury and vulnerabilities in hyperactivity and emotional symptoms were still observed. A follow up for these children and for parents and educational staff seems relevant if these difficulties are highlighted and can include education about possible vulnerabilities and resource availability. It is often behavioural difficulties that trigger a referral for support and these difficulties are often the focus of intervention, as they cause the most disruption, particularly in the classroom setting [33]. The results of the present study showed a moderate effect size in terms of conduct problems in this TBI sample, this may represent an opportunity for early intervention with this age group before behavioural difficulties becoming more entrenched and difficult to manage.

### *Future Research Directions*

In conclusion, while there is evidence of hyperactivity and emotional difficulties in children with TBI, there was no evidence for friendship difficulties in relation to their friendship with their closest friend in this age group; however, more longitudinal research is needed to determine if peer relationship difficulties become more apparent in the adolescent years. Also research that incorporates observational measures and teacher perspectives is required before conclusions can be made with confidence regarding social functioning in children with TBI. Future research might focus on specific areas of cognitive deficit, for example dysexecutive difficulties, which might account for the vulnerabilities observed. Given the heterogeneity of the TBI sample, researchers may wish to consider using more than one age group and groups with different lengths of time since injury or with longitudinal follow-up.

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## Tables

*Table 1: TBI Group Demographics*

	Sex	Age at Testing	Age at Injury (rounded to the nearest year)	Time since Injury (rounded to the nearest year)	Mechanism of Injury	GCS	Days spent in hospital
1	M	11	7	4	Fall from a height.	12	10
2	M	8	6	2	Fall.	9	8
3	M	9	7	2	Autopedestrian accident.	4	13
4	M	10	10	1	Autopedestrian accident.	9	4
5	M	11	9	2	Fall from a height.	3	24
6	M	12	10	3	Autopedestrian accident.	8	35
7	M	10	4	6	Fall.	-	5
8	M	12	11	1	Autopedestrian accident.	5	30
9	M	13	8	5	Autopedestrian accident.	9	14
10	M	13	7	5	Autopedestrian accident.	-	10
11	F	12	12	1	Autopedestrian accident.	12	10
12	F	8	8	1	Kicked by a horse.	9	7
13	F	11	11	1	Fall.	6	9
14	F	7	3	4	Fall from a height.	15	6

*Table 2 – Index of Multiple Deprivation Deciles*

IMD Deciles	Percentage of Total Sample (n = 28)	Percentage of TBI Group (n=14)	Percentage of Control Group (n=14)
1 ( <i>most deprived</i> )	7%	14%	0
2	25%	29%	22%
3	32%	22%	43%
4	7%	14%	0
5	0	0	0
6	0	0	0
7	7%	7%	7%
8	11%	7%	14%
9	4%	7%	0
10 ( <i>least deprived</i> )	7%	0	14%

*Table 3 – Demographic Information for TBI and Control Participants*

	<b>Age (years)</b> (n = 28) <i>Mean (SD)</i>	<b>Deprivation Percentage</b> (n=28) <i>Median (Range)</i>	<b>BPVS</b> (n = 28) <i>Mean (SD)</i>
TBI Group (10 males, 4 females)	10.6 (1.8)	25.7 (84.0)	85.7 (7.2)
Control Group (10 males, 4 females)	10.1 (1.7)	23.7(78.8)	90.3 (13.0)

*Table 4: Means and Standard Deviations of Scores by Group*

Variable	<b>TBI (n=14)</b> Median (Range)	<b>Control (n=14)</b> Median (Range)	<b>Effect size (r)</b>
FQQ – Validation and caring <sup>^</sup>	2.9 (2.4)	2.9 (2.3)	0.04 (small)
FQQ – Conflict and Betrayal	0.9 (3.1)	0.6 (2.9)	0.11 (small)
FQQ – Companionship and Recreation <sup>^</sup>	2.8 (1.8)	2.8 (2.4)	0.13 (small)
FQQ – Help an Guidance <sup>^</sup>	2.8 (3.6)	2.7 (3.1)	0.10 (small)
FQQ – Intimate Exchange <sup>^</sup>	2.6 (3.8)	2.5 (3.5)	0.10 (small)
FQQ – Conflict resolution <sup>^</sup>	2.7 (3.0)	3.0 (3.0)	0.13 (small)
LSDQ – Total Score	4.0 (12)	2.5 (12)	0.11 (small)
PIC-2 – SSK	48.0 (50)	46.0 (18)	0.11 (small)
PIC-2 – WDL	51.5 (50)	45.0 (29)	0.15 (small)
SDQ – Total Difficulties	12 (30)	4.5 (13)**	0.51 (large)
SDQ – Emotional Symptoms	3.5 (10)	0.5 (5.0)*	0.46 (medium)
SDQ - Hyperactivity	5.5 (10)	1.0 (6.0)**	0.65 (large)
SDQ – Peer Problems	1.0 (8.0)	1.0 (5.0)	0.15 (small)
SDQ – Conduct Problems	2.0 (6.0)	1.0 (6.0)	0.34 (medium)
SDQ – Prosocial Behaviour <sup>^</sup>	8.0 (8.0)	8.0 (6.0)	0.00 (small)

<sup>^</sup>Higher scores indicate less difficulty, \*p <0.05, \*\*p<0.01  
Effect sizes r < 0.3 small, r = 0.3–0.5 medium, r > 0.5 large

*Table 5: SDQ variables by group – percentages in the normal, borderline and abnormal ranges for each domain.*

	Normal		Borderline		Abnormal	
	TBI (n=14)	Control (n=14)	TBI (n=14)	Control (n=14)	TBI (n=14)	Control (n=14)
Total Difficulties	57%	100%	0	0	43%	0
Emotional Symptoms	64%	100%	29%	0	7%	0
Conduct Problems	57%	93%	21.5%	0	21.5%	7%
Hyperactivity	50%	93%	7%	7%	43%	0
Peer Problems	79%	93%	0	7%	21%	0
Prosocial Behaviour	86%	86%	7%	7%	7%	7%

*Table 6: Correlations between injury characteristics & SDQ scores in the TBI group (Kendall's tau).*

	Age at injury (n=14)	Time since injury (n=14)	GCS (n=12)
SDQ - Emotional Symptoms	0.09	0.07	0.07
SDQ - Hyperactivity	0.01	0.24	-0.07
SDQ - Total Difficulties	0.09	0.18	0.03

**CHAPTER THREE:**  
**ADVANCED PRACTICE I REFLECTIVE CRITICAL ACCOUNT**

**Reflective account of my experience while on a child neuropsychology placement**

**Kimberley Amanda Ross\***

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*Submitted in partial fulfilment of the requirements for the degree of Doctorate in Clinical  
Psychology (D. Clin. Psy)*

**Abstract:**

I have chosen to reflect on my experience of conducting neuropsychological assessments while on a child neuropsychology placement. This is an area that I have always been interested in. In this placement I found myself deviating from the assessment instruction manuals and over-compensating by praising children continually in sessions. I reflect on my learning experience both in terms of Rolfe et al's (2001) framework for reflective practice before moving onto a deeper reflection within psychodynamic models. Within Rolfe et al's model, I discuss each stage of reflection. This then leads me to think more about counter transference issues and personal experiences that may have led to my particular anxieties presenting in this environment. Finally, I reflect on professional issues, such as the emerging leadership role of clinical psychologists and how this reflection has allowed me to grow personally and professionally. I also discuss some of the key skills of clinical psychologists, such as the scientist-practitioner role and skills in building therapeutic relationships. I discuss how these skills place them at an advantage when carrying out cognitive assessments.

**CHAPTER FOUR:**  
**ADVANCED PRACTICE II REFLECTIVE CRITICAL ACCOUNT**

**Reflections on team dynamics and service issues**

**Kimberley Amanda Ross\***

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*Submitted in partial fulfilment of the requirements for the degree of Doctorate in Clinical  
Psychology (D. Clin. Psy)*

**Abstract:**

This reflective account focuses on my experience of working between a community mental health team (CMHT) and a primary care community mental health team (PCMHT). This enabled me to reflect on the different service structures and how this may impact on team dynamics. I reflect on a few situations at referral allocation meetings and discussions with staff that were particularly emotive for me. I use Rolfe et al's (2001) Framework for Reflexive Practice to provide a structured framework within which to reflect. I discuss each of the three stages of reflection: descriptive level of reflection, theory and knowledge building level of reflection and action oriented reflexive level of reflection. This allows me to reflect on personal reading, teaching and discussions with team members. I discuss issues such as staff burnout and how this may impact on team dynamics. I relate these experiences to relevant professional issues for clinical psychology, including our growing consultancy role. Finally, I reflect on how it felt to conduct this reflective account and how this may impact on my future career.



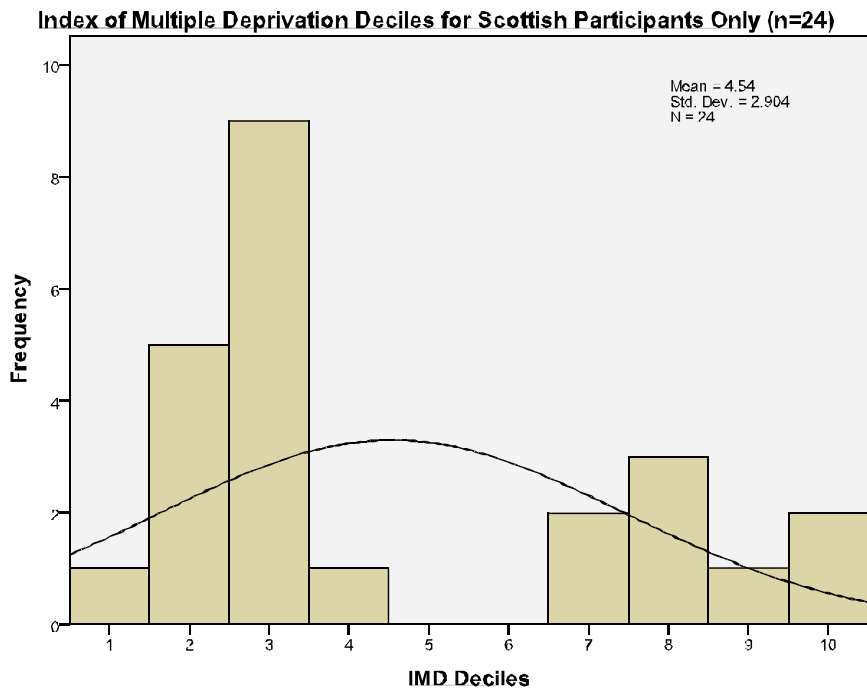
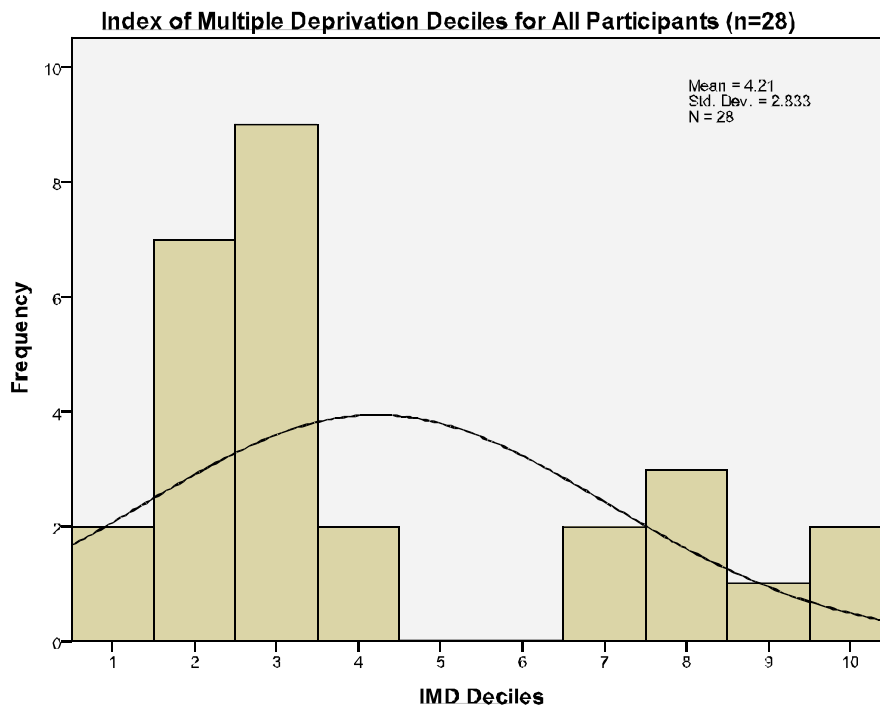
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## **Chapter One Appendices: Major Research Project**

## Appendix 1.1 - Deprivation Distribution for Scottish and English Participants



**Appendix 1.2 - Major Research Proposal**

**Doctorate in Clinical Psychology**

**Major Research Proposal**

**Friendship and psychosocial functioning in children who have sustained a moderate to severe Traumatic Brain Injury**

**July 2009**

**Matriculation Number: 0102851**

**Kimberley A Ross**

Research / Academic Supervisor: Professor Tom McMillan

Field Supervisor: Dr Liam Dorris

Word Count: 3533

## **Abstract**

Childhood is a time when psychosocial skills are of great importance both in terms of friendships and self-esteem (Windsor, 1995). The impact that a moderate or severe brain injury has on a child's friendship quality and general psychosocial functioning is of paramount importance if we are to intervene effectively with this population.

This study aims to investigate if children who have sustained a traumatic brain injury (TBI) have poorer friendship quality, higher rates of self-reported loneliness and more difficulties in general psychosocial functioning than non-injured controls. It will also investigate if younger age at injury is associated with a more significant impact on friendship quality.

The measures utilised in this study are: The friendship quality questionnaire revised (FQQ-R), the Loneliness and Social Dissatisfaction Scale (LSDS), the short-form version of the Personality Inventory for Children 2<sup>nd</sup> Edition (PIC-2) and a general measure of psychosocial functioning (Strengths and Difficulties Questionnaire (SDQ)). These will be administered to 18 children who have sustained a moderate to severe TBI and their main caregiver and to a control group of non-injured children (n=18) all aged between 7 and 12 years.

## **Introduction**

Childhood and adolescence is a time of psychosocial development. Social interaction skills are of great importance both in terms of friendships and self-esteem (Windsor, 1995). It has been suggested that traumatic brain injury (TBI) in childhood can have a significant impact on socio-emotional behaviour in terms of friendships, loneliness and general psychosocial functioning (Limond et al, 2009).

### **Friendship Quality and TBI**

Tonks et al (2007) found that children with severe acquired brain injury performed less well at reading emotions than age matched controls, they recommend that social functions should be routinely assessed following childhood brain injury so that deficits in these functions can be targeted in intervention. Turkstra et al (2001) found that compared to a normally developing control group, adolescents who had sustained a brain injury performed significantly lower in an emotional recognition task and also in a task that tested their ability to detect social conversational skills. Given this evidence it is possible that these difficulties could have a negative impact on friendships in children who have suffered traumatic brain injury (TBI).

Theory of mind describes an individual's awareness of others' mental states including the feelings, beliefs and desires of others. Baron-Cohen et al (1985) revolutionised autism research with their theory that deficits in theory of mind accounted for impairments in social skills, in particular impairments in social reciprocity and communication. Snodgrass and Knott (2006) found evidence to suggest theory of

mind deficits in children who had sustained a moderate or severe TBI relative to controls and also provided evidence for a deficit in emotional recognition. It is possible that impairments in theory of mind in could have an impact on social skills and moreover friendship quality in the TBI population.

In a longitudinal study of 45 children with either a mild, moderate or severe brain injuries, Fletcher et al (1990) found that more severely injured children engaged in fewer social activities. More recently, Prigatano and Gupta (2006) found that in the control group 75% had 4 or more friends but only 38.9% of children with mild, 20% of children with moderate and 14.3% of children with severe TBI had 4 or more friends. A review of research between 1970 and 1995 into children with a mild brain injury suggests that there were no immediate or long-term effects on psychosocial functions following a mild brain injury, however they concluded that as injury severity increased, more variability in findings was reported and therefore caution should be taken in accepting that there are no adverse effects following mild brain injury (Satz, 1997).

It appears however that there is a lack of research looking at the friendships quality in children who have sustained moderate to severe TBI, for example how well the children get along, how much sharing occurs and much of the research has focused on the specifics of the relationship, for example how many friends the child has. There is even less evidence that looks particularly at the child's perspective.

Bohnert et al (1997) is one of the few studies that investigated friendship quality in children with a mild, moderate or severe TBI. They found that parents of children with TBI's perceived their children as experiencing more problematic peer relationships than parents of children who had not sustained a TBI. They found no significant differences in friendship quality between the samples; however the sample included children with mild TBI's. On further investigation they found that children with more severe injuries had more difficulty in measures of friendship quality (i.e. managing conflict, developing intimacy and coordinating play). Therefore further research into the effects of more severe TBI on friendship quality is warranted.

#### Loneliness and general psychosocial functioning and TBI

Anderson (2003) suggests that emotional distress; conduct problems and problematic peer relationships are all associated with childhood brain injury. Andrews et al (1998) investigated the social and behavioural effects of traumatic brain injury in children with mild, moderate or severe injuries and compared data to a non-injured control group. They found that the TBI group had significantly lower levels of self-esteem and higher levels of loneliness and aggressive / antisocial behaviours.

#### Age at injury

Another important issue that appears to be neglected in this area is the impact that age at injury can have on psychosocial factors. Early beliefs were that the earlier the age at injury the better the prognosis in later life (Kolb et al 2000)). Contrary to this, there is now evidence to suggest that the younger children are more at risk of global rather



than focal problems due to the fact that those areas of the brain that are developing most rapidly are most vulnerable to damage (Chadwick et al 1981). Research has suggested that children who have sustained a traumatic brain injury are more at risk than adults of adverse effects and moreover, the younger the child is at the time of injury the more profound the impact on development (Taylor and Alden, 1997).

Anderson and Moore (1995) studied 2 groups of children, children who had sustained a head injury prior to 7 years and those that has sustained the injury after 7 years.

They found that children who had sustained the head injury in early childhood failed to exhibit the expected cognitive recovery at 2 years post-injury; children injured later were more likely to show improvements in IQ. Therefore it was felt that a further investigation into the effect of age at injury would be useful and if younger age at injury had a more detrimental affect on measures of psychosocial functioning.

### **Aims and Hypotheses:**

The study follows a group comparison design with children aged 7 to 12 years who have sustained a moderate or severe TBI and a group of non-injured controls and their parents.

The hypotheses are as follows:

- 1) The TBI (traumatic brain injury) group will rate the quality of their friendships as poorer than controls (Friendship Quality Questionnaire Revised (FQQ-R)).
- 2) Parents of children who have sustained a TBI will rate their child's friendship quality as significantly poorer than parents of controls (Personality Inventory for Children 2<sup>nd</sup> Edition (PIC-2)).

- 3) In the TBI group, younger age at injury will be associated with poorer friendship quality when time since injury is controlled for (FQQ-R and PIC-2).
- 4) The TBI group will report significantly higher rates of loneliness than controls (Loneliness and Social Dissatisfaction Scale (LSDS))
- 5) Parents of the TBI group will rate more difficulties in psychosocial functioning than parents of controls (Strengths and Difficulties Questionnaire (SDQ))

### **Plan of Investigation**

#### **Participants:**

##### **Experimental Group (Traumatic brain injury):**

The sample will be children aged between 7 and 12 years (based on age ranges of measures) who have sustained a moderate or severe traumatic brain injury.

##### **Inclusion criteria:**

- (i) There is documented evidence of a moderate or severe brain injury as assessed by the Glasgow Coma Scale Score (moderate GCS  $\leq$  12, severe GCS  $\leq$  8)
- (ii) Medical records are sufficiently detailed to determine severity of injury and age when injury occurred
- (iii) The injury was sustained between 6 months and 5 years prior to testing (as post-concussive symptoms are thought to resolve around 3 months post-injury, Anderson et al 2001).

##### **Exclusion criteria:**

- (i) Children with a premorbid learning disability, developmental disorder or severe behavioural problems; this will be verified through medical records.
- (ii) Children who fall below the normal range for their age on a measure of receptive English vocabulary (British Picture Vocabulary Scale 2<sup>nd</sup> Edition (BPVS-II)).
- (iii) Children in which the injury was non-accidental with parental cause, this is mainly eliminated through not using sample under 2 years and this will also be verified through medical records.

**Control Group:**

The sample will include children aged between 7 and 12 years recruited from mainstream primary and secondary schools in the Glasgow area. Non-injured controls will be matched on age and sex.

Exclusion Criteria:

Children with a learning disability, severe behavioural difficulties, a neurological or psychiatric condition or previous head injury (determined by a parental questionnaire).

Children who fall below the normal range for their age on a measure of receptive English vocabulary (British Picture Vocabulary Scale 2<sup>nd</sup> Edition (BPVS-II)).

**Recruitment**

The experimental group (TBI group) will be recruited from the Royal Hospital for Sick Children (RHSC) and the Southern General hospital, Glasgow. Limond et al (2009)

report that during 2002, a total of 644 children (under 16 years) were admitted to Glasgow with a traumatic brain injury for at least an overnight stay. This is equivalent to a rate of 4 in 1000 children per year. Some of the experimental group will also be recruited from a database at the Southern General Hospital. The information from this database will be checked by someone other than the main researcher. The families who meet the inclusion criteria will be sent an information pack outlining the purpose of the study and consent forms. Participants will opt into the study by sending back a signed consent form, when consent has been achieved the researcher will then access the child's medical notes and investigate if the child meets any of the exclusion criteria. If not, then the family will be contacted and an appointment arranged. This appointment will either be held at the RHSC or at the child's school.

The Director for Education for Greater Glasgow and Clyde asking permission to contact Head Teachers of primary and secondary schools in the area for the control group. The researcher will then write to Head Teachers of schools asking if they would partake in the study. Parents and children from the opted-in schools will then be sent information packs, which include parent and child information sheets, consent forms and exclusion criteria forms. The researcher will then arrange a time to meet the child in school to complete the child completed measures and inform parents of this time and send parental questionnaires.

### **Measures:**

There are three child self-report measures:

### **1) British Picture Vocabulary Scale II (BPVS II) (Dunn et al 1997)**

This is a measure of receptive vocabulary for Standard English and takes around 5 – 8 minutes to complete. It is administered individually for children aged 3 years to 15 years and provides norm-referenced scores. The test is assumed to have good reliability and validity as it is based on the BPVS (initial edition), which has been shown to have good reliability and validity (Happe, 1995 and Fonagy et al, 1997).

### **2) Friendship Quality Questionnaire – Revised: (Parker and Asher 1993)**

This measure was designed for children in Grades 3-6. It is a 41-item questionnaire that takes around 40 minutes to complete. Children are asked to indicate on a 5-point scale how true a particular quality is of their friendship with a particular friend. The items are then divided into 6 subscales: Validation and Caring, Conflict and betrayal, Companionship and recreation, Help and Guidance, Intimate Exchange and Conflict resolution.

Scores for each of the 6 subscales are determined as the mean score of the relevant items. Previous studies have further divided the FQQ-R items into two summary scores. The first is the Positive Friendship Quality summary score, which is the mean score of all items except the initial warm up item and the items pertaining to the Conflict and betrayal subscale. The second summary score is a Friendship Conflict score, which is the mean rating of the 6 Conflict and Betrayal items.

### **3) Loneliness and Social Dissatisfaction Scale (LSDS) (Asher and Wheeler 1985)**

This is a 24 item self-report measure. Children respond to each item on a 5-point scale indicating to what extent each item is true of them. A number of items overlap with the FQQ, therefore as with Parker and Asher's 1993 study a subset of three of the original questionnaire items will be used only: "I feel alone at school," "I feel left out of things at school," "I'm lonely at school." This therefore provides a measure of social dissatisfaction that is uncontaminated by previous questions and will take around 5 minutes to complete. Parker and Asher (1993) found the internal consistency of the 3-item scale was 0.77 and the correlation between this and the longer-version was 0.84.

There are two parent-completed measures:

**1) Personality Inventory for Children – 2<sup>nd</sup> edition – Behavioural Summary (PIC-2)**

(Wirt, Lachar, Klinedinst and Seat, 1990)

The standardised short-form version of the PIC-2 will be administered to parents (the Behavioural Summary), which is comprised of 96 true/false questions. This takes around 15 minutes to complete. The Social Skills and Social Withdrawal Sections of the PIC-2 will be utilised as a measure of friendship quality. These combined scores provide a Social Adjustment Composite Score (an aggregate of the 2 scores). These scales correspond theoretically with the construct of friendship quality. The scales of the PIC-2 are computed by summing a raw score, which is compared with gender normed data and a T-score is determined ( $50 \pm 10$ ).

**2) Strengths and Difficulties Questionnaire (SDQ) (Goodman 1999)**

This is used as a general measure of socio-behavioural assessment. The measure consists of a 25-item questionnaire, whereby parents indicate how true particular traits are of their child (i.e. not true, somewhat true, certainly true). It takes around 10 minutes to complete. It assesses 5 domains namely: hyperactivity, peer problems, emotional symptoms, conduct problems and pro-social behaviour. Each subscale has a clinical cut-off point; these are designed so that 80% of the population score within the average range, 10% within the borderline range and 10% of the population fall within the abnormal range. A summary score known as the Total Difficulties score can also be calculated, this is the mean of the items from the hyperactivity, peer problems, emotional symptoms and conduct problems domains.

### **Design:**

This study utilises a non-experimental fixed group comparison design. The independent variable will be group (i.e. TBI vs. control). Dependent variables are scores obtained from self-report and parental measures of the child's friendship quality (FQQ-R and PIC-2), scores of self-reported loneliness (LSDS) and parental scores of their child's general psychosocial functioning (SDQ).

### **Research Procedures:**

#### **Experimental (TBI) group**

On meeting the child the researcher will give a brief explanation of the requirements and the purpose of the session and ensure the child is still willing to take part in the study; this will also be an opportunity to answer any questions. The researcher will administer the

BPVS II, the FQQ-R and the LSDS to the child. The time required for this session will be approximately one hour. Parents will either be given the parental questionnaires to complete in the waiting room or they will be sent them in the post.

### **Control Group**

Once willingness to participate in the study has been given parents will be contacted by letter, indicating when the researcher intends to see their child in school and the issuing the parental measures. The parents will be given the contact details of the researcher. In the session the children will be given an explanation about the study and an opportunity to ask questions and the researcher will check that the child is willing to take part in the study. The researcher will then administer the child measures: BPVS II, FQQ-R and LSDS. This will take no longer than 1-hour.

### **Setting and Equipment:**

Child data will be collected within the RHSC or the child's primary or secondary school. Parental measures will be sent via post or administered in the waiting room if the parent is present at the appointment.

### **Commencing and Ending Sessions:**

The sessions will begin with the researcher building a rapport with the child and asking some general questions to put the child at ease. The questionnaire content will be put in context for the child; it will be explained that most children have problems with friendships and feel lonely at some point. Children will be given a certificate at the end



and thanked for their participation to ensure that the session ends on a more positive note. A Consultant Clinical Psychologist will be available to offer debriefing sessions to any participant who express any upset or distress.

**Justification in Sample Size (power calculation):**

As there is a lack of research measuring friendship quality in children who have sustained a moderate to severe head injury, studies of different but related constructs were utilised to complete power calculations. Tonks et al (2007) studied emotional-recognition skills, this concept would have a direct impact on friendships. For the Mind in Eyes test, the traumatic brain injury sample (n=18) were significantly poorer at carrying out this test than non-injured controls (n=67) ( $p < 0.043$ ), the effect size was calculated from means and standard deviations and is large ( $d = 0.87$ ). Power calculations indicate that a minimum of 18 participants in TBI group and 18 participants in the control group would be required for a power of 0.8 and an alpha of 0.05.

Snodgrass and Knott (2006) studied emotional recognition using the Mind in Eyes Test with 12 children with traumatic brain injury and compared these data to 12 age and sex matched controls and found a statistically significant difference between the groups. The effect size was calculated at 0.81. Power calculations based on this study suggest that a minimum of 18 TBI participants and a minimum of 18 control participants are required for a power of 0.8 and an alpha of 0.05. Although both of the above studies were researching different but related constructs i.e. emotional recognition compared to friendship quality, the fact that these effect sizes are so large is encouraging.

Cunningham et al (2007) studied friendship quality with some of the same measures as this study is utilising (i.e. FQQ and PIC-2) in children with neurodevelopmental conditions compared to a typically developing control group. It is felt that children with a neurodevelopment condition may be similar to the TBI child population. A significant difference ( $p < 0.01$ ) was found between the groups on one of the FQQ measures (validation and caring) with a medium effect size calculated ( $d = 0.65$ ). Power calculation based on this study suggested that a minimum of 30 participants in the children with neurodevelopmental conditions and 30 control participants would be required for a power of 0.8 and an alpha of 0.05. The PIC-2 also showed a significant group difference ( $p < 0.01$ ) on the social skills deficit measure with a medium effect size also ( $d = 0.52$ ). Power calculation based on this measure suggested that a minimum of 36 participants in the children with neurodevelopmental conditions and 36 control participants would be required for a power of 0.8 and an alpha of 0.05.

Therefore, it appears that there is much variation in the sample sizes of groups required to achieve a power of 0.8 and an alpha of 0.05 in the present study. Given the results of the above power calculations, it seems reasonable to suggest that a minimum of 18 TBI participants and 18 control participants would be necessary to achieve a power of 0.8 and an alpha of 0.05.

**Data Analysis:**

Data will be analysed using SPSS statistical software:

- a. Between Group Analyses:** T-tests will be carried out to determine if there is a significant difference between the groups in any of the summary scores of the four measures (FQQ-R, LSDS, PIC-2 & SDQ). Summary score analyses will be conducted first for the SDQ and FQQ-R. Effect sizes will also be calculated.
- b. Within Group Analyses:** Correlations will be carried out on the two FQQ-R summary scores and the two PIC-2 summary scores and age at injury and time since injury.

### **Ethical Issues**

Approval will be sought from the local ethics committee. In the unlikely event that any of the subjects become distressed throughout the sessions, the child's parents or teacher will be in close proximity will discuss this with. If more severe issues present, the researcher will advise the family to contact their General Practitioner regarding a referral to child and adolescent mental health services. However the measures are used routinely and there is no evidence to suggest that they cause distress to participants.

### **Health and Safety**

Participants will be mainly seen in school or in the RHSC. Staff will be aware of where the researcher is at all times. No home visits will be undertaken.

## **References**

*Only those not included in the MRP Project Paper (Chapter two)*

Anderson, SW, Bechara A, Damasio H, Tranel D, & Damasio AR. (1999). Impairment of social and moral behavior related to early damage in human prefrontal cortex. *Nature Neuroscience*, 2, 1032-1037.

Bigler, E.D. (2001). The lesion(s) in traumatic brain injury: implications for clinical neuropsychology. *Archives of Clinical Neuropsychology*, 16, 95-131.

Flatley A, Dorris L, McMillan TM. Social knowledge and communication in children with mild-moderate traumatic head injury: A preliminary study. (*under review*)

Levin, H. S., Song, J., Ewing-Cobbs, L., Chapman, S. B., Mendelsohn, D. B., Bruce, D., et al (1996). Dimensions of cognition measured by the Tower of London and other cognitive tasks in head injured children and adolescents. *Developmental Neuropsychology*, 12, 17-34.

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Schraf, M., & Hertz-Lazarowitz, R. (2003). Social network in the school context: Effects of culture and gender. *Journal of Social and Personal Relationships*, 20, 843-858.

Satz P, Zaucha K, McCleary C, Light R, Asarnow R, Becker D. (1997). Mild head injury in children and adolescents: A review of studies (1970-1995). *Psychological Bulletin*, 122(2), 107-131.

### **Amendments to Original Proposal**

Due to difficulties with recruiting enough numbers in the traumatic brain injury group (TBI), the upper age limit was increased to 13 years. Participants were also sought via NHS Newcastle and North Tyneside and the voluntary agency, the Child Brain Injury Trust. All amendments were approved by West of Scotland ethics committee and by local NHS Research and Development departments.

## Appendix 1.3 - Ethics Committee Approval Letter



### West of Scotland REC 3

Ground Floor, The Tennent Institute  
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Telephone: 0141 211 2123  
Facsimile: 0141 211 1847  
19 November 2009

Miss Kimberley A Ross  
Trainee Clinical Psychologist  
Dept of Psychological Medicine  
Gartnavel Royal Hospital  
1055 Great Western Road  
Glasgow G12 0XH

Dear Miss Ross

**Study Title:** Friendship and psychosocial functioning in children who have sustained a moderate to severe traumatic brain injury.  
**REC reference number:** 09/S0701/91  
**Protocol number:** Version 1

Thank you for your letter of 03 November 2009, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered by a sub-committee of the REC at a meeting held on 19<sup>th</sup> November 2009. A list of the sub-committee members is attached.

### Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

### Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

### Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

For NHS research sites only, management permission for research ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

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Where the only involvement of the NHS organisation is as a Participant Identification Centre, management permission for research is not required but the R&D office should be notified of the study. Guidance should be sought from the R&D office where necessary.

Sponsors are not required to notify the Committee of approvals from host organisations.

**It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).**

### Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Covering Letter		15 September 2009
REC application		15 September 2009
Protocol	Version 1	15 September 2009
Investigator CV		
Questionnaire: Friendship Quality		
Questionnaire: Loneliness and Social Dissatisfaction		
Questionnaire: Personality Inventory - children		
Questionnaire: Strengths and Difficulties		
Letter re Proposal University of Glasgow		16 June 2009
Letter re Proposal - University of Glasgow		28 July 2009
CV - Kimberley Ross		15 September 2009
CV - Liam Dorris		10 September 2009
Participant Consent Form: School Agreement Form		
Participant Information Sheet: Children - Controls	Version 2	15 October 2009
Participant Information Sheet: Children - Controls - Tracked	Version 2	15 October 2009
Participant Information Sheet: Parent - Controls	Version 2	15 October 2009
Participant Information Sheet: Parent - Controls - Tracked	Version 2	15 October 2009
Participant Consent Form: Children	Version 2	15 October 2009
Participant Consent Form: Children - Tracked	Version 2	15 October 2009
Response to Request for Further Information		03 November 2009
Participant Information Sheet: Schools	Version 2	15 September 2009
Participant Information Sheet: Parent	Version 2	15 October 2009
Participant Information Sheet: Parent - Tracked	Version 2	15 October 2009
Participant Information Sheet: School	Version 2	15 October 2009
Participant Information Sheet: School - Tracked	Version 2	15 October 2009
Participant Consent Form: Parent/Guardian	Version 2	15 October 2009
Participant Consent Form: Parent/Guardian - Tracked	Version 2	15 October 2009
Participant Consent Form: Parent/Guardian - Controls	Version 2	15 October 2009
Participant Consent Form: Parent/Guardian - Controls - Tracked	Version 2	15 October 2009
Exclusion Criteria - Controls	Version 2	15 October 2009
Exclusion Criteria - Controls - Tracked	Version 2	15 October 2009
School Agreement Form	Version 2	15 October 2009
School Agreement Form - Tracked	Version 2	15 October 2009
Letter from Glasgow City Council		03 November 2009

### Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

### After ethical review

Now that you have completed the application process please visit the National Research Ethics Service website > After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document "*After ethical review – guidance for researchers*" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Progress and safety reports
- Notifying the end of the study

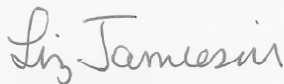
The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email [referencegroup@nres.npsa.nhs.uk](mailto:referencegroup@nres.npsa.nhs.uk).

**09/S0701/91**

**Please quote this number on all correspondence**

Yours sincerely



**Liz Jamieson**  
**Committee Co-ordinator on behalf of Dr Robert McNeill, Chair**

Email: [Liz.Jamieson@ggc.scot.nhs.uk](mailto:Liz.Jamieson@ggc.scot.nhs.uk)

Enclosures: List of names and professions of members who were present at the meeting and those who submitted written comments

"After ethical review – guidance for researchers"

Copy to: Dr Liam Dorris, RHSC, Greater Glasgow and Clyde NHS  
R&D office for NHS care organisation at lead site



## Appendix 1.4 - Research and development approval letter – NHS Greater Glasgow and Clyde



Coordinator: Dr M Barber  
Telephone Number: 0141 211 8548  
Fax Number: 0141 211 2811  
E-Mail: Michael.barber@ggc.scot.nhs.uk

R&D Management Office  
Western Infirmary  
Tennent Institute  
1<sup>st</sup> Floor, 38 Church Street  
Glasgow, G11 6NT

30 November 2009

Dept of Psychological Medicine  
Gartnavel Royal Hospital  
1055 Great Western Road  
Glasgow  
UK  
G12 0XH

### R&D Management Approval

Dear Kimberley Ross

**Project Title: Friendship and psychosocial functioning in children who have sustained a moderate to severe Traumatic Brain Injury.**

**Chief Investigator: Kimberley Ross**

**R&D Reference: GN09NE455**

**Protocol no (including version and date): V1 15/09/09**

I am pleased to confirm that Greater Glasgow & Clyde Health Board is now able to grant **Management Approval** for the above study.

As a condition of this approval the following information is required during the lifespan of the project:

1. SAES/SUSARS – If the study is a **Clinical Trial** as defined by the Medicines for Human Use Clinical Trial Regulations, 2004 (CTIMP only)
2. Recruitment Numbers on a quarterly basis (not required for commercial trials)
3. Any change of Staff working on the project named on the ethics form
4. Change of CI
5. Amendments – Protocol/CRF etc
6. Notification of when the Trial / study has ended
7. Final Report
8. Copies of Publications & Abstracts

**Please add this approval to your study file as this letter may be subject to audit and monitoring.**

Yours sincerely

Dr Michael Barber  
Research Co-ordinator

*Delivering better health*

[www.nhsggc.org.uk](http://www.nhsggc.org.uk)

## Appendix 1.5 - Research and development approval – NHS Newcastle and North Tyneside



### NHS Newcastle and North Tyneside Community Health

Research and Development  
12 Hedley Court  
Orion Business Park  
North Shields  
NE29 7ST  
Tel: 0191 293 1140  
Fax: 0191 293 1160  
Email: Gillian.johnson@newcastle-pct.nhs.uk

**Project ID: 2010MISC001**

28<sup>th</sup> January 2010

Miss Kimberley Ross  
Department of Psychological Medicine  
Gartnavel Royal Hospital  
1055 Great Western Road  
G12 0XH

**Re: Friendship, Psychosocial Functioning and Paediatric Brain Injury**

Thank you for sending me information about the above project. I am pleased to inform you that the Trust supports your proposed research study to take place in Newcastle Primary Care Trust.

We have registered your project on the Trust research database and you should keep us informed of your progress every 12 months to allow maintain Trust approval.

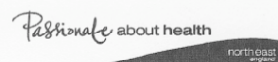
In addition, we also have an obligation to monitor at least 10% of all research studies undertaken in our area and the database is used to identify such projects. Should your project be randomly chosen for monitoring, the R & D Department will contact you.

In particular, it is a condition of our support that the R & D Department **must** be notified of:

- Completion date of the study;
- any significant changes to the study design;
- any decision made by a Research Ethics Committee regarding this study, including a copy of your ethics approval letter;
- all funding, awards and grants pertaining to this study, whether commercial or non-commercial;
- any serious adverse effects on participants or staff;
- any suspension or abandonment of the study;
- all publications and/or conference presentations of the findings of the study
- if the project is accepted onto the portfolio at any stage, the accruals must be attributed to Newcastle or North Tyneside PCT, as appropriate.

In line with national policy, the Trust will not give approval for any NHS research work which does not comply with Research Governance guidelines. (*The Research Governance Framework for Health and Social Care* is available from the DoH website)

Providing community healthcare services for  
Newcastle and North Tyneside Primary Care Trusts



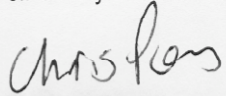
([www.doh.gov/research/rd3/nhsrandd/researchgovernance.htm](http://www.doh.gov/research/rd3/nhsrandd/researchgovernance.htm)).

The principal investigator is required to send a final report and a lay summary to the PCT within three months of the completion date of the research project.

Commencement of any work related to this study, implies agreement with the above conditions.

Please do not hesitate to contact us if you require further assistance.

Yours sincerely



**Christopher Piercy**  
**Associate Director of Patient Safety, Quality and Nursing**

*Please address all correspondence to Gillian Johnson quoting the Project ID number.*

## Appendix 1.6 - Glasgow City Council School approval letter



Executive Director  
Children and Families  
Margaret Doran

Education Services  
Glasgow City Council  
Wheatley House  
25 Cochrane Street  
Merchant City  
Glasgow G1 1HL

Phone Direct Line 0141-287-4946  
Fax 0141-287 3795  
Email [john.scougall@education.glasgow.gov.uk](mailto:john.scougall@education.glasgow.gov.uk)

Website [www.glasgow.gov.uk](http://www.glasgow.gov.uk)  
Our Ref JS/Rsrch  
Date 3 November 2009  
If phoning please ask for John Scougall

Ms Kimberley Ross  
6 Ardbeg Road  
Carfin  
MOTHERWELL  
North Lanarkshire  
ML1 4FE

Dear Ms Ross

**Proposed Research Project – Friendship and psychosocial functioning in children who have sustained a moderate to severe traumatic brain injury.**

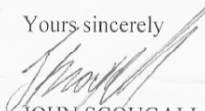
With reference to previous correspondence regarding the above, I now write to advise you that this department has no objection to you seeking assistance from our schools with your project. I would confirm however that it is very much up to the Head Teachers to decide whether or not their schools participate and assist you in your research.

**A copy of this letter should be sent to the Head Teachers when contacting the schools.**

This approval is also on the condition that as there is pupil involvement regarding this project, and the pupils are under sixteen years of age, parental/guardian consent **must be requested, and given**, before such involvement. Any researchers in contact with the children must have recently approved Disclosure Scotland checks.

I hope that this is helpful and that you have success with your project.

Yours sincerely



JOHN SCOUGALL  
Principal Officer  
Service Reform

## Appendix 1.7 - North Lanarkshire school approval letter



Our Ref:  
Your Ref:  
Contact: Philip McGhee  
Tel: 01236 812235  
Fax: 01236 812575  
E Mail: mcgheep@northlan.gov.uk  
Date: 11 November 2009

### Learning & Leisure Services

Jane Liddell  
Head of Education Quality & Development  
Municipal Buildings  
Kildonan Street  
Coatbridge ML5 3BT  
www.northlan.gov.uk

Dear Kimberley

Research Project: Friendship and Psychosocial Functioning

Thank you for returning the completed application form. I am pleased to inform you that approval has been granted at Authority level for you to approach the head/s of establishments, to ask if they are willing to participate in your project.

When you contact the head/s involved you should enclose a copy of this letter as confirmation of North Lanarkshire Council's authorisation but I would remind you that it is the head of establishment who has the final veto over whether his/her school will participate in the research project.

Can I also remind you that as well as providing the head of establishment with a draft of the letter to accompany the parental consent form you should discuss your intended contact with pupils in respect to your Disclosure Scotland form.

When you have completed your research you should provide each school with a copy of your findings.

May I take this opportunity to wish you every success with your project. If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

A handwritten signature in black ink that reads "Philip McGhee".

Philip McGhee

Quality Improvement Officer



Christine Pollock, Executive Director, Learning & Leisure Services, PO Box 14, Civic Centre, Motherwell ML1 1TW



Service and People First

## Appendix 1.8 – Parent Information Sheet (TBI)



University  
of Glasgow



### Parent Information Sheet

#### **Study: Friendship and social functioning in children following head injury**

My name is Kimberley Ross and I am a final year Trainee Clinical Psychologist at the University of Glasgow. As part of my training I am carrying out research looking at how head injuries affect children's friendships and social experiences. This kind of research will hopefully improve our knowledge of the effects of head injuries and help health care professionals provide the best care.

You and your child are being invited to take part in this study. This leaflet provides information about the study. If you have any questions please do not hesitate to contact me, my contact details are at the end of the leaflet. I have enclosed a child information sheet and would be grateful if you would read through this with your child.

#### ***What is the purpose of this research?***

This study is investigating if head injury affects children's friendships and social functioning. I want to compare information from children who have suffered a head injury to children who have never had a head injury. I hope to gain both the child's and parent's views. This research will add to our knowledge and ensure that children with head injuries get the best care.

#### ***Why have we been chosen to take part?***

All children aged between 7 and 13 years old who attended either Royal Hospital for Sick Children or the Southern General Hospitals in Glasgow after a head injury could be invited to take part in the study.

#### ***Do I have to take part?***

No, it is up to you and your child whether or not you want to take part. **If you decide to take part, please fill out the consent form, and return it to me in the envelope provided.** If you decide to take part you are both free to withdraw at any time without giving a reason. A decision to withdraw or not to take part will not affect any on-going care.

#### ***What will happen if I agree to take part?***

When I have received the signed consent form indicating that you and your child would like to take part, I will access the medical notes relating to your child's head injury. I will do this to determine how serious their head injury was and how long they spent in hospital.

I will then contact you to arrange a suitable time and place to meet your child. **I can either arrange to see your child in Royal Hospital for Sick Children, Glasgow or in their school, whichever is more convenient.** My study also has two parent-completed questionnaires. These ask about your child's social skills, mood and behaviour. These questionnaires should take no longer than 30 minutes to complete. If it is more convenient to see your child in school, then I will send the questionnaires to you with a stamped addressed envelope. If it is more convenient to see your child in the hospital, then I ask that you come along with your child to this meeting and I will issue you with the parent-completed questionnaires at this appointment.

***What will my child have to do?***

When I meet your child I will explain what is involved to them and check that they are willing to take part. I will ask your child to answer some questions about their relationship with their best friend and about experiences of loneliness. I will meet with your child only once and this should last approximately 50 minutes.

***Are there risks or benefits to taking part?***

There are no real risks to taking part. Your child will not be asked to take any medication or take part in any medical procedures.

The information you and your child provide us with will help us to understand more about the effects of childhood head injuries. This will help health professionals give the best type of care to children who have had a head injury.

***Will my taking part in the study be kept private?***

All information collected from you and your child will be kept strictly confidential. Any information about them that is reported in the research will have all identifiable information like their name and address removed. Only the researchers (myself, Dr Liam Dorris and Professor Tom McMillan) will have access to the information gathered. All information will be stored in locked filing cabinets.

***What will happen to the results of the study?***

It is intended that the results will be published in a journal that specialises in head injury research. You can obtain a copy of the publication by contacting Kimberley Ross.

**Thank you very much for taking the time to read this leaflet.**

**For Further Information Please Contact:**

- 1) Kimberley Ross, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694, Email: 0102851r@student.gla.ac.uk)
- 2) Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit (Tel: 0141 201 0780)
- 3) Professor Tom McMillan, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694)

*{This form was adapted and used for those recruited from NHS Newcastle and North Tyneside}*

## Appendix 1.9 – Child information sheet (TBI)



University  
of Glasgow



### **Children's Information Sheet** **Project: Friendship after head injuries**

My name is Kimberley Ross. I am a Trainee Clinical Psychologist at the University of Glasgow.

I would like to ask you to take part in my project. This project is about friendships in children who have had a head injury. It may help doctors understand more about the problems that children might have after a head injury. Please speak to your parents or guardians about this project. If you have any questions you can also ask me.

#### **What is this project for?**

Most children have trouble getting along with other people at some time. I want to find out if children who have had a head injury have more trouble making friends. I want to talk to some children who have had a head injury and some children who have not and their parents.

#### **Why have I been asked to take part?**

All children aged between 7 and 13 years that had a head injury and went to Yorkhill Hospital or the Southern General Hospital could have been asked to take part.

#### **Do I have to take part?**

No. Talk it over with your parent or guardian and decide if you want to take part or not. You can pull out at any time and don't have to say why. This will not affect the treatment you are getting from any doctors or nurses.



**If I agree to take part, what will happen next?**

I will have a look at the notes made by the doctors to find out a bit more about your head injury. I will then meet with you. **I can either meet you at Yorkhill Hospital or at your school, whichever you would prefer.** I will meet with you only **once.**

**What will I have to do?**

When we meet up I will ask you some questions about your friends and about how you feel you get along with people your age. This meeting will take about 50 minutes. I will also give your parents or guardians a questionnaire with the same sort of questions.

**Will my answers be private?**

All the information you give me will be kept private. Information in the report will not have your name on it. I might have to tell your teacher that you are taking part if I am meeting you in school.

**What will happen to the results?**

The results might be published in a book or magazine about head injuries that doctors read. You can get a copy of this from me (Kimberley Ross).

**Thank you very much for reading this leaflet**

**For More Information Please Contact:**

- Kimberley Ross, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694, Email: 0102851r@student.gla.ac.uk)
- Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit (Tel: 0141 201 0780)
- Professor Tom McMillan, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694)

*{This form was adapted and used for those recruited from NHS Newcastle and North Tyneside}*

**Appendix 1.10 – Consent form (TBI)**



**University  
of Glasgow**



**Kimberley Ross  
Trainee Clinical Psychologist  
Department of Psychological  
Medicine, Gartnavel Royal  
Hospital**

**Parent / Guardian Consent Form**

Title of the study: **Friendship and social functioning in children following head injury.**

Researcher: **Kimberley Ross**

- |   | <b>Please initial box</b> |
|---|---------------------------|
| 1. I confirm that my child and I have read and understood the information sheet dated 15 <sup>th</sup> October 2009 (Version 2) for the above study. We have had the opportunity to consider the information and ask questions.   | <input type="checkbox"/>  |
| 2. I understand that my participation and my child's is voluntary and that we are free to withdraw at any time without giving a reason, without any medical care or rights being affected.  | <input type="checkbox"/>  |
| 3. I understand that relevant sections of my child's medical notes (regarding their head injury) may be accessed as part of this study. I understand that only clinicians involved in the study will have access to these. I give permission for these individuals to have access to these records. | <input type="checkbox"/>  |
| 4. I agree to my child's teacher / school being contacted if necessary (i.e. only if it would be more convenient to see the child in school rather than the RHSC).  | <input type="checkbox"/>  |
| 5. I agree to myself and my child taking part in the above study, and my child agrees to take part.   | <input type="checkbox"/>  |

**PLEASE COMPLETE:**

**Name of Parent / Guardian:** \_\_\_\_\_ **Date:** \_\_\_\_\_ **Signature:** \_\_\_\_\_

**Name of Child:** \_\_\_\_\_ **Signature:** \_\_\_\_\_

**PLEASE PROVIDE A TELEPHONE NUMBER:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**Child's School and Class Teacher (if necessary):** \_\_\_\_\_

*{This form was adapted and used for those recruited from NHS Newcastle and North Tyneside}*

## Appendix 1.11 – Parent information sheet (controls)



University  
of Glasgow



### Parent Information – Controls

#### **Study: Friendship and social functioning in children following head injury**

My name is Kimberley Ross and I am a final year Trainee Clinical Psychologist at the University of Glasgow. As part of my training I am carrying out research looking at how head injuries affect children's friendships and social experiences. This kind of research will hopefully improve our knowledge of the effects of head injuries and help health care professionals provide the best care.

You and your child are being invited to take part in this study. I realise that your child may not have had a head injury, but I am interested in comparing children who have **not** had a head injury to those who have. This leaflet provides information about the study. If you have any questions, please don't hesitate to contact me, my contact details are at the end of the leaflet. I have enclosed a child information sheet and would be grateful if you would read through this with your child.

#### ***What is the purpose of this research?***

This study is investigating if head injury affects children's friendships and social functioning. I want to compare information from children who have suffered a head injury to children who have not suffered from a head injury. I hope to get both the child's and parent's views. This research will add to our knowledge and ensure that children with head injuries get the best care.

#### ***Why have we been chosen to take part?***

All children aged between 7 and 13 years who attend a school in the Glasgow or Lanarkshire area could be invited to take part in this study. I only need a small number of children from your child's school and I may need children of specific ages, so if you decide to participate, there is a chance that your child will not be chosen to participate.

#### ***Do I have to take part?***

No, it is up to you and your child whether or not you want to take part. If you decide to take part, please fill out the consent form, and return it to me in the envelope provided. You are both free to withdraw at any time without giving a reason. If you and your child are chosen to take part, you will form part of the "control group." This means the group that the head injured children will be compared to. It is very important that I make sure that children in the "control group" have never had a head injury or other neurological disorder. For this reason, I would be very grateful if you would complete the exclusion form that I have enclosed and return it to me along with the consent form in the envelope provided.

***What will happen if I agree to take part?***

When I have received your signed consent form indicating that you and your child wish to take part, I will arrange a time to meet your child in school and inform you of this time. My study also has two parent-completed questionnaires. These ask about your child's social skills, mood and behaviour. These questionnaires should take no longer than 30 minutes to complete. I will send these questionnaires to you with a stamped addressed envelope and ask you to complete them and send them back to me.

***What will my child have to do?***

When I meet your child in school I will explain what is involved to them and check that they are willing to take part. I will ask your child to answer some questions about their relationship with their best friend and about experiences of loneliness. I will meet with your child only once and this meeting should last approximately 50 minutes.

***Are there risks or benefits to taking part?***

There are no real risks to taking part. Your child will not be asked to take any medication or take part in any medical procedures. The information you and your child provide us with will help us to understand more about the effects of childhood head injuries. This will help health professionals give the best type of care to children who have had a head injury.

***Will my taking part in the study be kept private?***

All information collected from you and your child will be kept strictly confidential. Any information about them that will be reported in the research will have all identifiable information like their name and address removed. Only the researchers (myself, Dr Liam Dorris and Professor Tom McMillan) will have access to the information gathered. All information will be stored in locked filing cabinets.

***What will happen to the results of the study?***

It is intended that the results will be published in a journal that specialises in head injury research. You can obtain a copy of the publication by contacting Kimberley Ross.

**Thank you very much for taking the time to read this leaflet.**

**For Further Information Please Contact:**

- Kimberley Ross, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694, Email: 0102851r@student.gla.ac.uk)
- Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit (Tel: 0141 201 0780)
- Professor Tom McMillan, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694)

## Appendix 1.12 – Child information sheet (controls)



### **Children's Information Sheet – Controls** **Project: Friendship after head injuries**

My name is Kimberley Ross and I am a Trainee Clinical Psychologist at the University of Glasgow.

I would like to ask you to take part in my project. This project is about friendships in children who have had a head injury. It may help doctors understand more about the problems that children might have after a head injury. Please speak to your parents or guardians about this project. If you have any questions you can also ask me.

#### **What is this project for?**

I want to find out if children have difficulties making friends after they have had a head injury. I want to talk to some children who have had a head injury and some children who have **not** had a head injury and their parents.

#### **Why have I been asked to take part?**

All children aged between 7 and 13 years who go to school in Glasgow or Lanarkshire could have been asked to take part.

#### **Do I have to take part?**

No. Talk it over with your parent or guardian and you can decide if you want to take part or not. You can pull out at any time and don't have to say why.

#### **What will happen next?**

I only need a small number of people from your school and your age, so there is a chance that you will not be chosen to take part if you agree. If you are chosen to take part then I will come to meet you **at school**. I will meet with you only **once**.

**What will I have to do?**

When we meet up I will ask you some questions about your friends and about how you feel you get along with people your age. This meeting will take about 50 minutes. I will also give your parents or guardians a questionnaire with the same sort of questions.

**Will my answers be private?**

All the information you give me will be kept private. Information in the report will not have your name or address on it. I will tell your teacher that you are taking part because I'll be meeting you at school.

**What will happen to the results?**

The results might be published in a book or magazine about head injuries that doctors read. You can get a copy of this from me (Kimberley Ross).

**Thank you very much for reading this leaflet**

**For More Information Please Contact:**

- Kimberley Ross, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694, Email: 0102851r@student.gla.ac.uk)
- Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit (Tel: 0141 201 0780)
- Professor Tom McMillan, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694)

**Appendix 1.13 – Consent form (controls)**



**University  
of Glasgow**



**Parent / Guardian Consent Form**

Title of the study: **Friendship and social functioning in children following head injury.**

Researcher: **Kimberley Ross**

**Please initial box**

1. I confirm that my child and I have read and understood the information sheet dated 15<sup>th</sup> October 2009 (Version 2) for the above study. We have had the opportunity to consider the information and ask questions.
2. I understand that our participation is voluntary and that we are free to withdraw at any time without giving a reason, without their medical care or legal rights being affected.
3. I understand that only clinicians involved in the study will have access to the information gathered as part of this study.
4. I agree to my child's teacher being contacted to arrange an appointment in the school setting.
5. I agree to myself and my child taking part in the above study, and my child agrees to take part.

**PLEASE COMPLETE:**

**Name of Parent / Guardian:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Name of Child:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Address (for parent-completed questionnaires to be sent):**

\_\_\_\_\_  
\_\_\_\_\_

**Telephone Number:** \_\_\_\_\_

**Child's School:** \_\_\_\_\_

**Class Teacher:** \_\_\_\_\_

## Appendix 1.14 – School information sheet



University  
of Glasgow

### School Information Sheet



#### **Study: Friendship and social functioning in children following head injury**

My name is Kimberley Ross and I am a final year Trainee Clinical Psychologist at the University of Glasgow. As part of my training I am carrying out research looking at how head injuries affect children's friendships and social experiences. This kind of research will hopefully improve our knowledge of the effects of head injuries and help health care professionals provide the best care.

Your school is being invited to take part in the above research study. This leaflet provides information about the study. My contact details are at the end of this leaflet; please do not hesitate to contact me if you have any questions.

#### ***What is the purpose of this research?***

This study is investigating if head injury affects children's friendships and social functioning. I want to compare information from children who have suffered a head injury to children who have not. I hope to gain both the child's and parent's views. This research will add to our knowledge and ensure that children with head injuries get the best care.

#### ***Why has this school being asked to take part?***

The Education Service has approved this study (please see the enclosed letter of approval) and I have gained their permission to write to mainstream schools in your area, inviting them to participate in this research. Your school has been chosen at random. Children recruited from mainstream school will form the "control group" of children who have not sustained a head injury. The information gathered from the "control group" will be compared to that gathered from children who have suffered head injury.

#### ***What happens if our school agrees to participate?***

If you decide to participate, I will issue the school with information packs for children in some of the classes. I will then ask class teachers if they would distribute these to the children. I will therefore not require class lists or names of pupils. These information packs will contain parent and child information sheets; consent forms and exclusion criteria forms. Parents and children have then to opt into the study via sending a signed consent form to the researcher. I will then contact the school to arrange a suitable time to



meet with the child in school that creates as little disruption as possible. I will also inform the child's parents of this meeting time.

***What will the child have to do?***

My meeting with the child should last approximately 50 minutes. It would be best if we could have a quiet space, free from distractions. I will ask the child to carry out a short assessment of word understanding. I will then ask the child to answer some questions about their relationship with their best friend and about experiences of loneliness. There are also parental-completed questionnaires that will be posted to parents.

***What is the school expected to do?***

The school will be asked to distribute information packs to children and ask them to take them home to their parents. If some parents and children agree to participate in the study, then I will ask the school to provide a quiet space that I can use to complete the questionnaires with the children.

***Does this school need to take part?***

No, it is the head teacher and schools decision whether or not they wish to take part. **If you decide that this research is something that your school would be interested in being involved in, then I would be grateful if the head teacher could sign and send back the School Agreement Form.** Once I have received this, I will contact the school to discuss this further.

***Are there risks or benefits to taking part?***

No, these questionnaires have been used many times and have not been found to create distress in children. I understand this project may cause some unavoidable disruption to the school, however I will try to limit this as much as possible and the information provided will help us to understand more about the effects of childhood head injuries and how to provide the best care.

**Thank you very much for taking the time to read this leaflet.**

**For Further Information Please Contact:**

- Kimberley Ross, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694, Email: 0102851r@student.gla.ac.uk)
- Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit (Tel: 0141 201 0780)
- Professor Tom McMillan, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0694)

**Appendix 1.15 – School agreement form**



**University  
of Glasgow**



**Kimberley Ross  
Trainee Clinical  
Psychologist  
Department of Psychological  
Medicine, Gartnavel Royal**

**School Agreement Form**

Title of the study: **Friendship and social functioning in children following head injury.**

Researcher: **Kimberley Ross**

**Please initial box**

1. I confirm that I have read and understood the information sheet dated October 2009 and understand what is expected of the school.
2. WE AS A SCHOOL (please tick):

AGREE

DISAGREE

TO PARTICIPATE IN THIS STUDY.

\_\_\_\_\_  
Name of Head Teacher

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

Please provide a contact Telephone Number: \_\_\_\_\_

School Name: \_\_\_\_\_

## Appendix 1.16 - Guidelines for submission to *Brain Injury*

### Brain Injury Instructions for Authors

#### Manuscript Preparation

Authors should prepare and upload two versions of their manuscript. One should be a complete text, while in the second all document information identifying the author(s) should be removed from files to allow them to be sent anonymously to referees. When uploading files authors will then be able to define the non-anonymous version as "File not for review".

*Brain Injury* considers all manuscripts at the Editors' discretion; the Editors' decision is final.

*Brain Injury* considers all manuscripts on the strict condition that they are the property (copyright) of the submitting author(s), have been submitted only to *Brain Injury*, that they have not been published already, nor are they under consideration for publication, nor in press elsewhere. Authors who fail to adhere to this condition will be charged all costs which *Brain Injury* incurs, and their papers will not be published. Copyright will be transferred to the journal *Brain Injury* and Informa UK Ltd., if the paper is accepted.

#### General Guidelines

Please write clearly and concisely, stating your objectives clearly and defining your terms. Your arguments should be substantiated with well reasoned supporting evidence.

In writing your paper, you are encouraged to review articles in the area you are addressing which have been previously published in the Journal, and where you feel appropriate, to reference them. This will enhance context, coherence, and continuity for our readers.

For all manuscripts, gender-, race-, and creed-inclusive language is mandatory.

Use person-first language throughout the manuscript (i.e., persons with brain injury rather than brain injured persons).

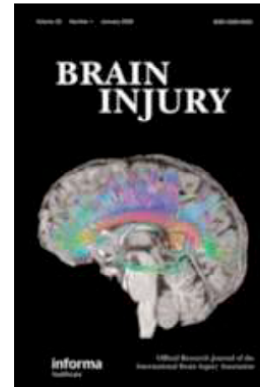
Ethics of Experimentation: Contributors are required to follow the procedures in force in their countries which govern the ethics of work done with human subjects. The Code of Ethics of the World Medical Association ([Declaration of Helsinki](#)) represents a minimal requirement.

Abstracts are required for all papers submitted, they should not exceed 200 words and should precede the text of a paper. [See below](#) for further information.

Authors should include telephone and fax numbers as well as e-mail addresses on the cover page of manuscripts.

#### File preparation and types

Manuscripts are preferred in Microsoft Word format (.doc files). Documents must be double-spaced, with margins of one inch on all sides. Tables and figures should not appear in the main text, but should be uploaded as separate files and designated with the appropriate file type upon submission. References should be given in Council of Science Editors (CSE) Citation & Sequence format (see [References](#) section for examples).



Manuscripts should be compiled in the following order: title page; abstract; main text; acknowledgments; Declaration of Interest statement; appendices (as appropriate); references; tables with captions (on separate pages); figures; figure captions (as a list).

## **Title Page**

A title page should be provided comprising the manuscript title plus the full names and affiliations of all authors involved in the preparation of the manuscript. One author should be clearly designated as the corresponding author and full contact information, including phone number and email address, provided for this person. Keywords that are not in the title should also be included on the title page. The keywords will assist indexers in cross indexing your article. The title page should be uploaded separately to the main manuscript and designated as “title page – not for review” on ScholarOne Manuscripts.

## **Abstract**

Structured abstracts are required for all papers, and should be submitted as detailed below, following the title and author's name and address, preceding the main text.

For papers reporting original research, state the primary objective and any hypothesis tested; describe the research design and your reasons for adopting that methodology; state the methods and procedures employed, including where appropriate tools, hardware, software, the selection and number of study areas/subjects, and the central experimental interventions; state the main outcomes and results, including relevant data; and state the conclusions that might be drawn from these data and results, including their implications for further research or application/practice.

For review essays, state the primary objective of the review; the reasoning behind your literature selection; and the way you critically analyse the literature; state the main outcomes and results of your review; and state the conclusions that might be drawn, including their implications for further research or application/practice.

The abstract should not exceed 200 words.

## **Tables, figures and illustrations**

The same data should not be reproduced in both tables and figures. The usual statistical conventions should be used: a value written  $10.0 \pm 0.25$  indicates the estimate for a statistic (e.g. a mean) followed by its standard error. A mean with an estimate of the standard deviation will be written 10.0 SD 2.65. Contributors reporting ages of subjects should specify carefully the age groupings: a group of children of ages e.g. 4.0 to 4.99 years may be designated 4 +; a group aged 3.50 to 4.49 years 4 ± and a group all precisely 4.0 years, 4.0.

Tables and figures should be referred to in text as follows: figure 1, table 1, i.e. lower case. 'As seen in table [or figure] 1 ...' (not Tab., fig. or Fig).

The place at which a table or figure is to be inserted in the printed text should be indicated clearly on a manuscript:

*Insert table 2 about here*

Each table and/or figure must have a title that explains its purpose without reference to the text. Tables and/or figure captions must be saved separately, as part of the file containing the complete text of the paper, and numbered correspondingly. The filename for the tables and/or figures should be descriptive of the graphic, e.g. table 1, figure 2a.

## Tables

Tables should be used only when they can present information more efficiently than running text. Care should be taken to avoid any arrangement that unduly increases the depth of a table, and the column heads should be made as brief as possible, using abbreviations liberally. Lines of data should not be numbered nor run numbers given unless those numbers are needed for reference in the text. Columns should not contain only one or two entries, nor should the same entry be repeated numerous times consecutively. Tables should be grouped at the end of the manuscript on uploaded separately to the main body of the text.

## Figures and illustrations

Figures must be uploaded separately and not embedded in the text. Avoid the use of colour and tints for purely aesthetic reasons. Figures should be produced as near to the finished size as possible. Files should be saved as one of the following formats: TIFF (tagged image file format), PostScript or EPS (encapsulated PostScript), and should contain all the necessary font information and the source file of the application (e.g. CorelDraw/Mac, CorelDraw/PC). All files must be 300 dpi or higher.

Please note that it is in the author's interest to provide the highest quality figure format possible. Please do not hesitate to contact our Production Department if you have any queries.

## Notes on Style

All authors are asked to take account of the diverse audience of *Brain Injury*. Clearly explain or avoid the use of terms that might be meaningful only to a local or national audience.

Some specific points of style for the text of original papers, reviews, and case studies follow:

- *Brain Injury* prefers US to 'American', USA to 'United States', and UK to 'United Kingdom'.
- *Brain Injury* uses conservative British, not US, spelling, i.e. colour not color; behaviour (behavioural) not behavior; [school] programme not program; [he] practises not practices; centre not center; organization not organisation; analyse not analyze, etc.
- Single 'quotes' are used for quotations rather than double "quotes", unless the 'quote is "within" another quote'.
- Punctuation should follow the British style, e.g. 'quotes precede punctuation'.
- Punctuation of common abbreviations should follow the following conventions: e.g. i.e. cf. Note that such abbreviations are not followed by a comma or a (double) point/period.
- Dashes (M-dash) should be clearly indicated in manuscripts by way of either a clear dash (-) or a double hyphen (- -).
- *Brain Injury* is sparing in its use of the upper case in headings and references, e.g. only the first word in paper titles and all subheads is in upper case; titles of papers from journals in the references and other places are not in upper case.
- Apostrophes should be used sparingly. Thus, decades should be referred to as follows: 'The 1980s [not the 1980's] saw ...'. Possessives associated with acronyms (e.g. APU), should be written as follows: 'The APU's findings that ...', but, NB, the plural is APUs.
- All acronyms for national agencies, examinations, etc., should be spelled out the first time they are introduced in text or references. Thereafter the acronym can be used if appropriate, e.g. 'The work of the Assessment of Performance Unit (APU) in the early 1980s ...'. Subsequently, 'The APU studies of achievement ...', in a reference ... (Department of Education and Science [DES] 1989a).
- Brief biographical details of significant national figures should be outlined in the text unless it is quite clear that the person concerned would be known internationally. Some suggested editorial emendations to a typical text are indicated in the following with square brackets: 'From the time of H. E. Armstrong [in the 19th century] to the curriculum development work

associated with the Nuffield Foundation [in the 1960s], there has been a shift from heurism to constructivism in the design of [British] science courses'.

- The preferred local (national) usage for ethnic and other minorities should be used in all papers. For the USA, African-American, Hispanic, and Native American are used, e.g. 'The African American presidential candidate, Jesse Jackson...' For the UK, African-Caribbean (not 'West Indian'), etc.
- Material to be emphasized (italicized in the printed version) should be underlined in the typescript rather than italicized. Please use such emphasis sparingly.
- n (not N), % (not per cent) should be used in typescripts.
- Numbers in text should take the following forms: 300, 3000, 30 000. Spell out numbers under 10 unless used with a unit of measure, e.g. nine pupils but 9 mm (do not introduce periods with measure). For decimals, use the form 0.05 (not .05).

## **Acknowledgments and Declaration of Interest sections**

Acknowledgments and Declaration of interest sections are different, and each has a specific purpose. The Acknowledgments section details special thanks, personal assistance, and dedications. Contributions from individuals who do not qualify for authorship should also be acknowledged here. Declarations of interest, however, refer to statements of financial support and/or statements of potential conflict of interest. Within this section also belongs disclosure of scientific writing assistance (use of an agency or agency/ freelance writer), grant support and numbers, and statements of employment, if applicable.

### Acknowledgments section

Any acknowledgments authors wish to make should be included in a separate headed section at the end of the manuscript preceding any appendices, and before the references section. Please do not incorporate acknowledgments into notes or biographical notes.

### Declaration of Interest section

All declarations of interest must be outlined under the subheading "Declaration of interest". If authors have no declarations of interest to report, this must be explicitly stated. The suggested, but not mandatory, wording in such an instance is: *The authors report no declarations of interest.* When submitting a paper via ScholarOne Manuscripts, the "Declaration of interest" field is compulsory (authors must either state the disclosures or report that there are none). If this section is left empty authors will not be able to progress with the submission.

Please note: for NIH/Wellcome-funded papers, the grant number(s) must be included in the Declaration of Interest statement.

*Click here to view our full [Declaration of Interest Policy](#).*

## **Mathematics**

*Click for more information on the [presentation of mathematical text](#).*

## **References**

References should follow the Council of Science Editors (CSE) Citation & Sequence format. Only works actually cited in the text should be included in the references. Indicate in the text with Arabic

numbers inside square brackets. Spelling in the reference list should follow the original. References should then be listed in numerical order at the end of the article. Further examples and information can be found in *The CSE Manual for Authors, Editors, and Publishers, Seventh Edition*. Periodical abbreviations should follow the style given by Index Medicus.

Examples are provided as follows:

**Journal article:** [1] Steiner U, Klein J, Eiser E, Budkowski A, Fetters LJ. Complete wetting from polymer mixtures. *Science* 1992;258:1122-9.

**Book chapter:** [2] Kuret JA, Murad F. Adenohypophyseal hormones and related substances. In: Gilman AG, Rall TW, Nies AS, Taylor P, editors. *The pharmacological basis of therapeutics*. 8th ed. New York: Pergamon; 1990. p 1334-60.

**Conference proceedings:** [3] Irvin AD, Cunningham MP, Young AS, editors. *Advances in the control of Theileriosis*. International Conference held at the International Laboratory for Research on Animal Diseases; 1981 Feb 9-13; Nairobi. Boston: Martinus Nijhoff Publishers; 1981. 427 p.

**Dissertations or Thesis:** [4] Mangie ED. *A comparative study of the perceptions of illness in New Kingdom Egypt and Mesopotamia of the early first millennium* [dissertation]. Akron (OH): University of Akron; 1991. 160 p. Available from: University Microfilms, Ann Arbor MI; AAG9203425.

**Journal article on internet:** [5] De Guise E, Leblanc J, Dagher J, Lamoureux J, Jishi A, Maleki M, Marcoux J, Feyz M. 2009. Early outcome in patients with traumatic brain injury, pre-injury alcohol abuse and intoxication at time of injury. *Brain Injury* 23(11):853-865. <http://www.informaworld.com/10.1080/02699050903283221>. Accessed 2009 Oct 06

**Webpage:** [6] *British Medical Journal* [Internet]. Stanford, CA: Stanford Univ; 2004 July 10 - [cited 2004 Aug 12]; Available from: <http://bmj.bmjournals.com>

**Internet databases:** [7] *Prevention News Update Database* [Internet]. Rockville (MD): Centers for Disease Control and Prevention (US), National Prevention Information Network. 1988 Jun - [cited 2001 Apr 12]. Available from: <http://www.cdcnpin.org/>

## **Chapter Two Appendices: Systematic Literature Review**



## Appendix 2.1 - Methodological Quality Appraisals of Studies

Author:

Title:

Year of publication:

Journal title:

Checklist completed by:

(Score 1 if met, 0 if not met or unable to determine)

Were specific hypotheses and/or objectives stated?	
Were the settings and locations where data was collected stated?	
Control or comparison group used?	
Were subjects randomly allocated to groups?	
Is the method of randomisation appropriate?	
Was the total sample size >20 participants?	
Was the total sample size >40 participants?	
Were at least some of the measures standardised assessment tools?	
Were the measures appropriate for age group?	
Were the inclusion / exclusion criteria clearly stated?	
Did the article specify the severity of the brain injury for ABI participants and was the method of diagnosis appropriate (e.g. by a medical professional, GCS)?	
Did the injury occur at least 6 months ago (to ensure the results were not a reflection of the recovery process?)	
Was follow up data collected after post intervention data (i.e. to see if effects were maintained post intervention)?	
Were all participants included in the analysis?	
If not, was intent-to-treat analysis used? (award 1 point if a point is granted on the above item)	
Were those assessing the outcomes blind to the group?	
Was a power calculation used or sample size justified?	
Was the intervention described in detail (i.e. how it was administered etc) or was there reference to a manual?	
Were the characteristics of subjects clearly described (e.g. demographic information such as age, gender)?	
Did the results relate to the initial hypotheses?	
Statistical analysis appropriate?	
Data adequately described (means, ranges etc)?	
Were effect sizes calculated?	
Were effect sizes moderate or better?	
Was there sufficient information to calculate effect size? (i.e. mean and SD's)	
Was age taken into account as a possible confounding factor?	
Total Quality Rating	/26
<b>Quality Rating: Poor (&lt;50%) Moderate (50-75%) High (&gt;75%)</b>	

## Appendix 2.2 – Full Titles and Information on Outcomes Measures

**Table 2**

<b>Outcome Measures</b>	<b>Abbreviation</b>	<b>Description</b>
Wechsler Intelligence Scale for Children – Revised	WISC - R	Measure of intellectual functioning, provides full IQ, verbal IQ and performance IQ scores.
Wechsler Adult Intelligence Scale – Revised	WAIS - R	Measure of intellectual functioning, provides full IQ, verbal IQ and performance IQ scores (for ages 16+)
Continuous Performance Test II	-	Standardised and computerised attention test, measures selective attention, processing speed and inhibition.
Visual and Auditory - Reaction Time Tests	-	Reaction time test for simple auditory and visual stimuli.
Gordon Diagnostic System	GDS	Vigilance test – child is shown a series of digits and told to respond when a particular combination is shown.
Stroop Test	-	Words printed in colour that is incongruent with the word.
Binary Choice Test	-	Computerised measure of choice reaction time.
Coding	-	Manualised assessment of selective attention in the form symbols and numbers that are paired.
Trail Making Test	-	Measure of selective attention similar to ‘connect-the-dots’
Digit Span Test	-	Free recall of a string of digits immediately after presentation.
15 Word Test	-	Child has to listen to 15 words presented 5 times then to free recall as many words as possible, delayed recall was recorded 40 minutes later.
Rey-Osterrieth Complex Figure recall.	-	Child is asked to reproduce a complex geometrical design after a delay.
Rivermead Behavioural Memory Test.	-	Involves a number of practical everyday tasks, face recognition, remembering a route and short story.
Test of Everyday Attention for Children	TEACH	Measures the ability to selectively attend, sustain, divide and switch attention and inhibit responses.
Behavior Rating Inventory of Executive Functioning	BRIEF	Questionnaire answered by parents relating to executive functions.
Test of Nonverbal Intelligence - 2	TONI-2	Measure of intelligence, aptitude, abstract reasoning, and problem solving that is free of the use of language.
Benton Visual Form Discrimination Test	-	Reproduction of drawing designs, tests visual perception and ability to solve visual constructional problems.
Wide Range Assessment of Memory and Learning	-	Comprised of 2 verbal, 2 visual and 2 attentional tests that measures immediate and delayed memory functioning.
Tower of London Test	-	Executive functioning tests that measures planning in particular.
Wisconsin Card Sorting Test	-	Measures ability to shift attention and flexibility.

**Table 3**

<b>Outcome Measure</b>	<b>Abbreviation</b>	<b>Description</b>
Child Behaviour Checklist	CBCL	113 item parent / guardian measure of child behaviour problems.
Home and Community Social Behaviour Scale	HCSBS	64-item parent report scale of social competence and antisocial behaviour.
Brief Symptom Inventory – Global Severity Index	BSI-GSI	53-item questionnaire for adults that measures psychological distress.
Conflict Behaviour Questionnaire	CBQ	Questionnaire measuring distress in families, completed by parents and children over 8 years.
Child Depression Questionnaire	CDQ	Child questionnaire that measures depressive symptoms.
Interaction Behavior Questionnaire	IBQ	Measure of distress in families.
Parent-Adolescent Relationship Questionnaire	PARQ	School conflict scale of the parent-adolescent relationship.
General Functioning Scale of Family Assessment Devise	FAD-GF	Parental completed questionnaire that measures global family problem solving, communication and behaviour management.
Family Burden of Injury Inventory	FBII	Parent report questionnaire that assesses unique burdens associated with paediatric TBI.
Parenting Stress Inventory	PSI	Questionnaire measuring distress in parents.
Global Severity Index of Symptom Checklist	GSISC	90 item questionnaire for adults that measures psychiatric symptoms.
Anxiety Inventory	-	10 item measure of adult anxiety symptoms.
Centre for Epidemiologic Studies Depression Scale	-	Brief measure of depressive symptoms that can identify those at risk of developing clinical depression.
Rehabilitation Institute of Chicago Rating Scale of Pragmatic Communication Skills	RICE-RSPCS	Measures a range of pragmatic communication skills such as conversational skills, ability to augment meaning, regulate meaning and use of context to convey information.
Communication Performance Scale	CPS	A behavioural rating scale containing 13 pragmatic communication skills e.g. facial expression, syntax, cohesiveness, initiation of conversation etc.
Vineland Adaptive Behavior Scale	VABS	Measures communication, daily living skills, socialisation, motor skills and maladaptive behaviour.

**Appendix 2.3 – Guidelines for submission to *Developmental Medicine & Child Neurology*.**

**Developmental Medicine & Child Neurology**

Author Guidelines

All papers should be submitted online at <http://mc.manuscriptcentral.com/dmcn>. Please email the editorial office with any queries about the process ([dmcn@editorialoffice.co.uk](mailto:dmcn@editorialoffice.co.uk)).

Papers published in *Developmental Medicine and Child Neurology* (DMCN) are freely available online from 12 months after publication. Authors who wish to make their papers freely accessible immediately upon publication may use Wiley-Blackwell's pay-to-publish service, OnlineOpen. (See Section 5, 'OnlineOpen', below.)

**Note to NIH Grantees** Pursuant to NIH mandate, Wiley-Blackwell will post the accepted version of contributions authored by NIH grant-holders to PubMed Central upon acceptance. This accepted version will be made publicly available 12 months after publication. For further information, see [www.wiley.com/go/nihmandate](http://www.wiley.com/go/nihmandate).

The journal follows the guidelines of the International Committee of Medical Journal Editors ([www.icmje.org](http://www.icmje.org)) and Wiley-Blackwell's Best Practice Guidelines on Publication Ethics ([www.wiley.com/bw/publicationethics/](http://www.wiley.com/bw/publicationethics/)) In particular, please note the following points.

**Presentation and formatting of your paper**

**a) Maximum length requirements**

Article type	Abstract	"What this paper adds"	Text words (excl refs)	References	Figures/ tables
Original article	Structured, 200 words	3 to 5 points	3000	25	4
Systematic review	Structured, 200 words	3 to 5 points	As appropriate		
Other review	Unstructured, 150 words	1 to 2 points	3000	25	4
Case report	Unstructured, 150 words	1 to 2 points	1500	15	2
Clinical letter	Unstructured, 150 words	1 to 2 points	1500	15	2
Letter to the Editor	None	None	750	5	1
Editorial, commentary, opinion	None	None	700	5	0

**b) All papers**

**General** Use single-line spacing for all parts of the submission. Include tables and figure legends in your main article file, after the references. Submit figures (illustrations) as separate files, as described below. Name all files using the surname of the first author (e.g. Smith.doc, Smith fig1.tif, etc.).

**Title page** Include the title of the paper, authors' names, main appointments and primary affiliations (i.e. one affiliation only per author), and word count. Identify the corresponding author and give his or her postal address, fax number, and e-mail address.

**Abstract** On the second page of original articles and systematic reviews, provide a full structured abstract of no more than 200 words, with the following headings: Aim; Methods, Results, Interpretation. Non-systematic reviews and case reports should have a non-structured abstract of up to 150 words, covering the aims, method, results, and conclusions of the study.

On the abstract page, also provide a shortened form of the title (up to six words) for use as a running foot.

**'What this paper adds'** All original articles and systematic reviews should have a section 'What this paper adds' after the abstract. This should comprise three to five bullet points, totaling 25 to 50 words, summarizing the new knowledge contributed by the study. Other articles should have one or two similar bullet points.

### **c) Original articles**

Articles should comprise an introductory section (but not headed 'Introduction'), followed by 'Method' (with optional subheadings, such as 'Participants' [rather than 'Subjects'] and 'Statistical analysis'), 'Results', and 'Discussion' sections. The Discussion section should include the limitations of the study. Subheadings should otherwise be kept to a minimum.

Papers longer than 3000 words, such as those reporting randomized controlled trials, may be published at the Editors' discretion.

### **d) Reviews**

We publish two types of review. One is a fully detailed comprehensive review of a subject, such as a systematic review, with full referencing and a word-count appropriate to the topic and amount of material to be covered. The other is intended to be a more personal view providing the reader with up-to-date information about the subject in question in a relatively brief format, referring to significant international papers but not forming a comprehensive overview of the literature.

### **h) References**

The Vancouver style is used, as recommended by the International Committee of Medical Journal Editors. Cite using a superscript number in the text, with a numerical list of references at the end of the paper presented in order of citation. Cite only peer-reviewed, published material. The journal does not recognize abstracts or submitted (as opposed to accepted, or 'forthcoming') papers as proper citations; such material should not be listed with the references but cited only in text, followed by '(personal communication)'.

List all authors unless more than six, in which case list the first three followed by 'et al', using Index Medicus abbreviations for journal names (see [www.nlm.nih.gov/tsd/serials/lji.html](http://www.nlm.nih.gov/tsd/serials/lji.html)). Order and punctuate bibliographic information as follows, omitting issue month and number unless

needed to distinguish issues. For additional citation formats, adapt appropriate examples from the NLM's *Citing Medicine* ([www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=citmed](http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=citmed)).

Abrams RA, Tsai AM, Watson B, Jamali A, Lieber RL. Skeletal muscle recovery after tenotomy and 7-day delayed muscle length restoration. *Muscle Nerve* 2003; 23: 707-14.

Mesibov GB, Kunc L, Schopler E. Asperger syndrome or high functioning autism? Current issues in autism. New York: Plenum Press; 1998.

Finnegan LP, Kaltenbach K. Neonatal abstinence syndrome. In: Hoekelman RA, Nelson NM, editors. *Primary pediatric care*. 2nd ed. St. Louis: Mosby Yearbook, Inc.; 1992. 1367-78.

For references to online sources, supply the author names, full title, and full URL including the date on which the site was accessed.

### **i) Figures and tables**

*Note that the Editors may decide that large figures or tables should be published online-only.*

**Tables, figure legends and appendices** Set out on separate pages at the end of (and as part of) the main document, after the references.

**Tables and appendices to be published online only** Present as separate files in Microsoft Word or Rich Text format.

**Figures** (e.g. illustrations, charts and photographs) Present electronically as separate files (not in the main text of the article). Guidelines about acceptable file formats and illustration preparation are provided at [authorservices.wiley.com/bauthor/illustration.asp](http://authorservices.wiley.com/bauthor/illustration.asp).

Please label radiographs, CT, or MRI scans with left [L] and right [R], and if appropriate with anterior [A] and posterior [P]. Areas of interest should be marked with an arrow. For EEGs please indicate the gain, timescale, and lead position.

Graphs should be as simple as possible, not three-dimensional, and not framed. Shading should be white, black, or strong hatching, not grey. No background lines should be used (except for bars and axes).

**Colour** If colour printing of figures is essential for their comprehension, please indicate this in the covering letter. There is normally a charge to the author for printing in colour. It is possible to publish a figure in black and white in the print version of the issue but in colour in the online version at no extra charge.

### **j) Statistical reporting**

The Editors advise reading "Statistical recommendations for papers submitted to *Developmental Medicine & Child Neurology*" (Rigby AS, *Dev Med Child Neurol* 2010, 52 (3): 293-298) for guidelines on appropriate use and reporting of statistical analyses.

### **k) Supporting information (supplementary material)**

DMCN publishes online supporting information (including audio and video files, data sets, additional images, and large appendices) that cannot be included in the print version of an article. This material should be relevant to and supportive of the parent article. For guidelines see [authorservices.wiley.com/bauthor/suppmat.asp](http://authorservices.wiley.com/bauthor/suppmat.asp).

**Style points**

**Jargon** Avoid it strenuously. The journal aims to communicate across disciplines, and many of its readers do not have English as their first language, so plain language is always preferred. The Editors may clarify and shorten manuscripts accepted for publication as necessary.

**Abbreviations** These should be kept to a minimum and restricted to those that are generally recognised. They must be spelled out in full on first usage in text and again in figure captions and table footnotes. They should be avoided in titles, headings and subheadings

**Participant details** Give mean (SD) age in years and months (not decimal years) and sex (*n*, not %). Ensure this information is included in the abstract. In the text, indicate where study and comparison groups are from and how participants were selected.

**Measurements** Use SI units, except for blood pressure (mmHg); convert imperial units to metric. Do not use percentages for sample sizes below 50; use the symbol '%' in tables. Show standard deviations as (SD), not  $\pm$ . Abbreviate probability with a lower case italicized *p*.

**Numbers** In general, use numerals, but spell out numbers at the beginning of sentences. Spell out numbers 'one' to 'nine' if they refer to nouns that are not units of measurement, e.g. 'The results from four children confirm the findings'. For ages and time periods, use years, months, weeks and days, not decimals (e.g. 5 years 3 months, not 5.25 years).

**Equipment and drugs:** Include (in parentheses) the name of the manufacturer, the city, and country of production.