

**SOCIAL KNOWLEDGE AND COMMUNICATION IN CHILDREN WITH
TRAUMATIC BRAIN INJURY
& RESEARCH PORTFOLIO**

PART ONE

(Part two bound separately)

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

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Dedicated to the memory of my mum, Anne Flatley.

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CHAPTER ONE: SMALL SCALE SERVICE RELATED PROJECT

Referrals of individuals with Anorexia Nervosa to an Adult Mental Health service in the North of Glasgow.

Repaired in accordance with guidelines in the Doctorate in Clinical Psychology course handbook (Appendix 1.1)

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Abstract

Background: Anorexia nervosa has one of the highest mortality rates of any psychiatric disorder, yet no specialised service for the treatment of eating disorders exists within Greater Glasgow. Adults with anorexia are therefore referred to generic mental health services, but rates of attrition are high. The high drop-out rates mean it is difficult for researchers to accurately gauge factors which may influence treatment outcomes within this clinical population. **Aims:** The present study aimed to examine the demographic and clinical characteristics of all individuals with anorexia who were referred to North of Glasgow Clinical Psychology services, and to investigate any possible links between clinical characteristics and treatment outcomes. **Method:** A retrospective design was used to analyse all referrals of anorexic individuals made to Clinical Psychology services in the North of Glasgow, over the past three years (n=20). **Results:** The results showed that some tentative links could be made between clinical characteristics and treatment outcomes; individuals who were referred by their GPs were more likely to currently be discharged from Clinical Psychology, as were the patients who did not have a BMI stated on referral. It was also found that patients with a prior history of contact with services were marginally more likely to be receiving on-going treatment from Clinical Psychology services. However interpretations were limited by the study's small sample size. **Discussion:** The issues regarding attrition and withdrawal from services suggest that it may be important to further investigate whether any specific factors influence or predict outcome of treatment within this clinical population. The present study hypothesised that treatment outcome in anorexia nervosa may be influenced by the patient's conception of the intervention they receive as being adequate in terms of *approach*, as being delivered in an acceptable *context* and as being subjectively regarded as *timely*.

Introduction

Eating disorders are serious and common illnesses with among the highest standardised mortality ratios of any psychiatric disorders (Hay, Bacaltchuk, Claudino, Ben-Tovin & Yong 2005). The two major eating disorders which most commonly present to generic adult mental health services are anorexia nervosa and bulimia nervosa. Criteria for the two disorders are not mutually exclusive; however people suffering from anorexia nervosa are below normal weight – usually having a Body Mass Index (BMI) of less than 20.

Anorexia nervosa is a disorder characterised by extreme loss of weight brought on by extreme fear of fatness and concern with body shape and size. The sufferer tries to control weight mainly by eating very little, but may use other measures such as strenuous exercise, vomiting or laxatives (Button & Warren 2001). It is ten times more prevalent amongst females and the estimated lifetime prevalence is approximately 0.7% (Robinson 2000). The disorder typically starts in adolescence, and co-morbid features include depression, low self-esteem, obsessive-compulsive traits and a broad spectrum of medical disorders (Herzog, Deter, Fiehn & Petzold 1997). Due to its relatively early onset, the anorexic adults who are referred to generic adult mental health services are commonly those for whom the disorder has become chronic. With these more chronic individuals clinical presentations are frequently complex, hence it is widely agreed that optimum intervention strategies should involve multi-dimensional treatments and multi-disciplinary team approaches (Hay et al 2005). Therefore, the present study will aim to investigate whether the clinical characteristics of individuals have any influence on the destination of their referral within Clinical Psychology services in the North of Glasgow.

Despite the NICE Guidelines for England and Wales (the closest national guidelines for Scottish clinical practice) recommending that individuals with anorexia are treated using psychological interventions delivered on an outpatient basis, there are no standardised treatment manuals for this population. As Clinical Psychology is a discipline based around evidence-based practice, it is unsurprising that anecdotal evidence suggests that many clinicians working in generic services feel a certain degree of anxiety when embarking on therapeutic endeavours with anorexic individuals. Furthermore, in terms of service provision, it has been noted that access to specialist treatment is dependent on geographical location (Crisp 2002). This indeed appears to be the case, as Edinburgh and Aberdeen have specialist

services but no such dedicated team exists in Greater Glasgow. Any anxiety felt by clinicians is perhaps compounded by the fact that generic adult mental health services are charged with providing services which cover a spectrum of disorder severity – from young adults whose difficulties may be relatively transient to those who have lived with the diagnosis for decades (Palmer & Treasure 1999). The reasons why the treatment of eating disorders does not exist as a specialism in Glasgow may simply reflect the interests of professionals working within the geographical area. However, there is research to suggest that anorexia nervosa is a disorder predominantly occurring in individuals from the highest social classes (McClelland & Crisp 2001); hence it could be argued that specialist services are more likely to exist in relatively more affluent areas. Another aim of the present study will therefore be to examine the demographic characteristics of individuals with anorexia nervosa who are referred to the North of Glasgow Clinical Psychology services.

An issue faced by all teams receiving referrals of anorexia regards the high rate of attrition from services. Due to the egosyntonic nature of the disorder patients frequently resist treatment and are ambivalent, or at worst, disruptive during its course. This is theorised to be due to the anorexic individual's belief that their eating behaviours are functional coping strategies which afford them a sense of control, rather than something problematic. The issues regarding attrition and withdrawal from treatment make it significantly more difficult for researchers to accurately gauge the factors which influence successful treatment outcome (Ben-Tovim, Walker, Gilchrist, Freeman, Kalucy & Esterman 2001). However, research focusing on narrative accounts of individuals who have withdrawn from psychological therapy suggested that three key aspects of the patient's experience of treatment significantly influenced outcome; the treatment *approach*, the *context* within which treatment took place, and the subjective appraisal of the intervention as being *timely* (Eivors, Button, Warner & Turner 2003). Thus, examining referral histories in conjunction with demographic and clinical characteristics, and focusing on possible links to treatment outcomes may have a place in helping to inform clinical management.

Therefore, the present study aims to:

- Investigate whether the referral histories and clinical characteristics of individuals influence their referral to Clinical Psychology services within the North of Glasgow
- Examine the demographic characteristics of individuals with anorexia nervosa, who are referred to the North of Glasgow Clinical Psychology services.

- Investigate any possible links between the clinical and demographic characteristics of the referred individuals and their treatment outcomes.

Method

Sample

The sample consists of individuals who were referred to either the Direct Access Clinical Psychology service or the CMHTs in the North of Glasgow, and who have a diagnosis of either restrictive or binge/purge anorexia. The sample is made up of all patients with these diagnoses who were referred over the past 3 years (n=20). The ages of the referred individuals ranged from 18 to 44 years old, and the median age was 23 years old. Nineteen females and one male made up this sample. In terms of deprivation categories, 35% of the referrals came from the area of highest deprivation (category 7), and 40% of the referrals came from deprivation category six. Furthermore, 10% of referrals came from deprivation category five and 15% came from deprivation category three.

Design

This audit uses a retrospective design to analyse total referrals to Clinical Psychology services in the North of Glasgow.

Procedures

The following data was collected: the gender of the individual, their age, their postcode and corresponding deprivation category, locality and team to which they were referred, who they were referred by and their BMI at referral. Furthermore, details of subtype of anorexia nervosa and any comorbid disorders were collected, along with information detailing any previous contact with services (inpatient or outpatient) with regards to their eating disorder. Finally, the current status of the patient within the service was recorded, and if they had been discharged the reason for this was also recorded.

Ethical Considerations

In accordance with the Central Office for Research Ethics Committees (COREC) report of 2004, the present audit did not require ethical clearance, as it was a service audit and a non-intervention study which did not impact on individual patient care. Furthermore, during data collection the individuals' details were anonymised hence: each appropriate referral was

assigned an identifying number, and all subsequent data collected was encoded to remove any identifying features and preserve confidentiality.

Results:

In the current sample, 19 out of the 20 individuals were female, 55% (n = 11) had the diagnoses of restrictive anorexia nervosa, and 45% (n = 9) were categorised within the binge/purge subtype of the disorder.

Overall, 65% of the referrals in the current sample (n = 13) were sent to the Direct Access Clinical Psychology services, and the CMHTs in the North of the city received the remaining 35% (n = 7). In terms of overall referrals to localities within the North of Glasgow; Maryhill received 60% of the current sample of referrals (12 out of the 20), Strathkelvin received 30% (n = 6) and the remaining two referrals were received by the Springburn/Possil locality teams. More specifically, in Maryhill the Direct Access service received 45% (n = 9) and the CMHT received 15% (n = 3) of referrals. The Strathkelvin locality team had 20% of the total referrals go to their Direct Access service (n = 4) and 10% go to the CMHT (n = 2). No referrals from the current sample were originally directed to the Springburn/Possil Direct Access service, but the CMHT in this locality received 10% of them (n = 2).

[Insert Figure 1 about here]

The ages of individuals referred to Clinical Psychology services range from 18 to 44 years old. Figure 1 shows that the majority of individuals referred were young adults: individuals aged 20 and 21 years old made up approximately 36% and 30% of the sample respectively. Furthermore, 23 year olds accounted for 10% of referrals.

[Insert Figure 2 about here]

The data showed that 70% of individuals (14 out of the 20) had a comorbid diagnosis at the time of their referral to Clinical Psychology. Figure 2 shows that depression affected 25% of those referred, low self esteem affected 15% and childhood sexual abuse was reported by 10% of referred individuals. Furthermore, 50% of those referred (n = 10) had previous experience

with services before being referred to Clinical Psychology, and two individuals had experienced a period of inpatient treatment.

[Insert Figure 3 about here]

As the above figure shows, no information regarding Body Mass Index (BMI) was given on approximately 55% of the referrals (n = 11). Notably however, while 10% of referred individuals (n = 2) had BMIs of 18 and 19 (just under what would be considered “normal”) two individuals were referred with BMIs of 13 – which is considered to be potentially life-threatening.

Figure 4 shows that 65% (n = 13) of the referrals received by the Direct Access service and the CMHTs came from GPs. A further 25% (n = 5) of referrals were sent to Clinical Psychology Services by Psychiatrists working within the CMHTs. Just under half of the total referrals (9 out of the 20) were given the status “Routine”, 40% (n = 8) were marked as “Urgent”, and the remaining three were not categorised.

[Insert Figure 4 about here]

In terms of the current status of the individuals included in this study (see Figure 5), 55% (n = 11) have been discharged from Clinical Psychology services. Six individuals (30%) were undergoing treatment at the time of data collection, two were being referred on to another service (specifically; a specialist service dealing with sexual abuse and assault) and one individual was awaiting appointment.

[Insert Figure 5 about here]

Of the 11 individuals who were discharged from Clinical Psychology services, 8 were discharged after failing to attend appointments, withdrawing or refusing treatment. Figure 6 also shows that two patients were discharged because they had completed treatment, and one individual’s involvement with another service lead to their discharge.

[Insert Figure 6 about here]

Chi square tests were run to investigate any potential associations between the demographic and clinical characteristics of the individuals referred to Clinical Psychology and their referral pathways and treatment outcomes. Associations between presence of comorbid diagnosis, source of referral, history of previous contact with services, BMI at referral, and team to which the individual was referred were investigated. Also, potential associations between the presence of a comorbid disorder, history of previous contacts, and the current status of the referral, were examined along with presence of a comorbid diagnosis, team referred to, and reason for discharge. For all of these analyses the expected frequency of cells was less than 5, so the Fisher's Exact Probability test was used, but no associations were found between these variables. However, using Cramer's V, it was found that 31% of variance in current status of referral could be explained by the source of the referral, 27% could be explained by a history of previous contact with services, and 30% could be explained by whether BMI was stated on referral.

Discussion

The aims of the present study were to investigate whether clinical characteristics influence referral to Clinical Psychology services in the North of Glasgow, to examine the demographic characteristics of those referred, and to investigate any possible links between the clinical and demographic characteristics of referred individuals and their treatment outcomes.

The results of the current study showed that patients referred to Clinical Psychology services in the North of Glasgow were mostly young females in their early twenties, and 65% of them were referred to the Direct Access teams. Sixty-five percent of the referrals were made by GPs, 70% of individuals had a comorbid diagnosis and only 45% had a recorded BMI at time of referral. Investigation of clinical outcomes uncovered that 55% of the referred individuals have now been discharged from Clinical Psychology services – with withdrawal and refusal to embark on treatment accounting for approximately 73% of discharges. Analysis of possible links between the clinical and demographic characteristics and treatment outcomes showed that 31% of the variance in current status could be explained by the source of the referral, 27% could be explained by a history of previous services, and 30% could be explained by whether BMI was stated at referral.

In terms of characteristics, the demographic results found in the current study were unsurprising: anorexia has long been recognised as a disorder that predominantly affects females in their early adulthood (Ben-Tovim 2003). However, despite research showing that anorexia is more prevalent amongst the higher social classes, 75% of referrals within the current sample came from deprivation category areas 7 and 6 – the most socially and economically deprived areas in Greater Glasgow (McCloone, 2004). This may indicate that it is inaccurate to think of anorexia as solely the disorder of the affluent, and that class distribution of anorexic individuals will more likely mirror that of the population from which they are taken (Leighton & Millar 1985, as cited in McClelland & Crisp 2001).

It is interesting to note that the results of the present study showed that 65% of individuals were referred to the Direct Access services, rather than to the multi-disciplinary CMHTs, which traditionally deal with more severe and entrenched mental health problems. Although there is agreement in the literature that multi-dimensional treatments and multi-disciplinary teams provide the optimum framework for treating anorexic patients, Palmer & Treasure (1999) suggested that local and general services may in fact be the most appropriate services for mild cases or for chronic stable anorexia nervosa. It was claimed that no one service type provides optimal care to such a heterogeneous population, and the inclusion of sufferers in mainstream services may alleviate some of the stigma experienced (Eivors et al, 2003).

The present study's finding that the majority of patients referred had comorbid conditions is in line with much of the literature (Button & Warren 2001). However, the fact that nearly half of those referred did not have their BMI stated on their referral letter is potentially concerning: The NICE Guidelines (2004) state that individuals with eating disorders should be assessed and receive treatment at the earliest opportunity, particularly those at risk of severe emaciation. Failure to include a BMI rating when referring may mean services are not made fully aware of the extent of the individual's emaciation, and this could prevent that individual getting the most appropriate treatment as quickly as possible.

Research into the treatment of anorexia nervosa suggests that approximately 50% of patients with anorexia nervosa drop out of treatment prematurely (Eivors et al 2003). Of the individuals from the current sample who have been discharged from services, 73% were discharged following non-attendance or withdrawal from treatment. It has been argued that rates of attrition are high because little attention has been paid to the personal perspectives of

patients on the causes of their eating disorders or the factors that contribute to recovery (Tozzi, Sullivan, Fear, McKenzie & Bulik 2002). It may be that understanding the reasons behind the actions of such individuals are more important in terms of ensuring engagement than controlling and containing detrimental eating behaviours. Furthermore, interventions focusing on symptoms could be argued to enable individuals to continue their effective strategy of focusing life around food as a means of coping with stress, and may inadvertently reinforce maladaptive eating behaviours.

In terms of the associations found between clinical and demographic characteristics and treatment outcomes, it could be hypothesised that all three are linked to the proposition mentioned earlier by Eivors et al (2003): treatment outcome is influenced by the individual's conception of the intervention received as adequate in terms of *approach*, as being delivered in an *acceptable* context and subjectively being thought of as *timely*. It could be argued that source of referral, history of previous contact and the individual's BMI on referral are all factors that could be integrated into Eivors et al's proposition regarding treatment success or failure, and hence the current status of the individual within Clinical Psychology services. However, it should be noted that the variance accounted for by these factors was only moderately sized, and therefore caution should be used in interpreting these results.

The central limitation of the present study regards the small sample size used. Future replication of the present study would therefore benefit from using a considerably larger sample, perhaps made up of all the individuals with anorexia nervosa who are referred to Clinical Psychology services within the Greater Glasgow area. Furthermore, in the light of current findings, a more extensive research project could attempt to investigate the specific reasons why individuals with anorexia nervosa drop out of Clinical Psychology services within the North of Glasgow.

In conclusion, the present study found that some tentative links can be made between clinical characteristics and treatment outcomes for patients with anorexia nervosa, who are referred to the North of Glasgow Clinical Psychology services. In terms of demographic characteristics, the majority of the results gained from the present study were similar to those predicted in the literature. However, the small sample size in the current study limits the interpretations that can be made.

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Fig.1: Ages of Anorexic patients referred to Clinical Psychology

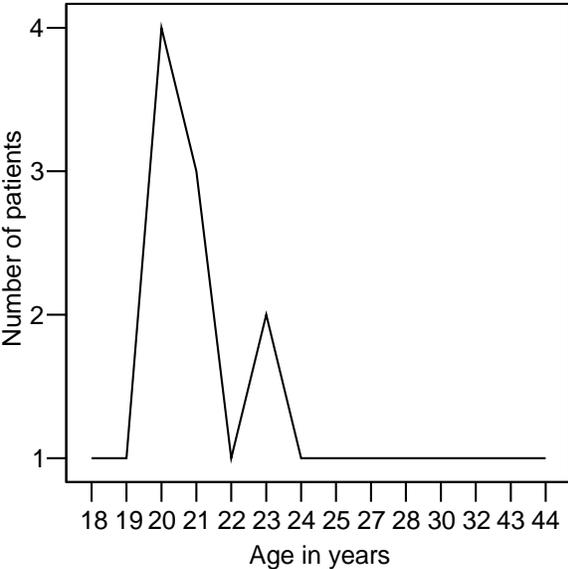


Fig.2: Co morbid diagnosis of individuals referred to Clinical Psychology services

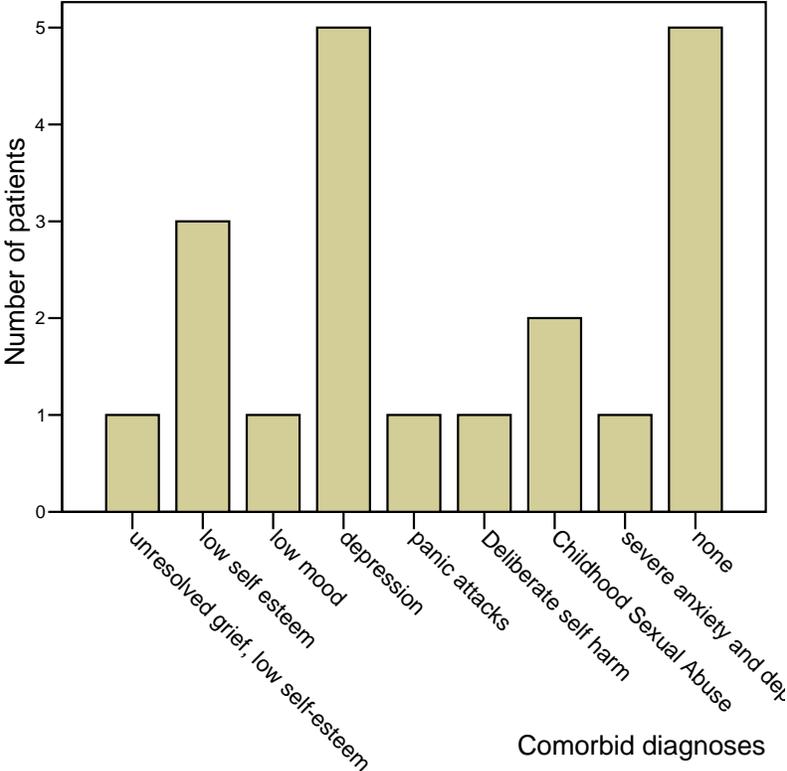


Fig.3: Body Mass Index (BMI) of patient at time of original referral

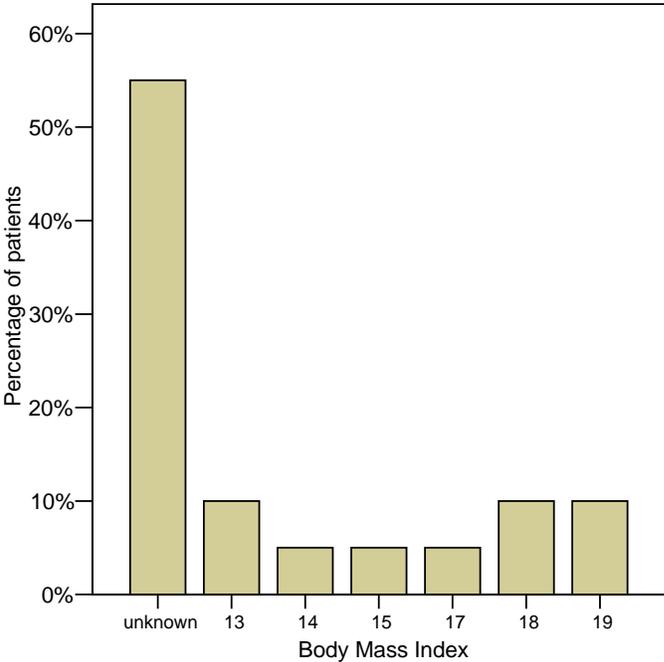


Fig.4: Source of referral to Clinical Psychology

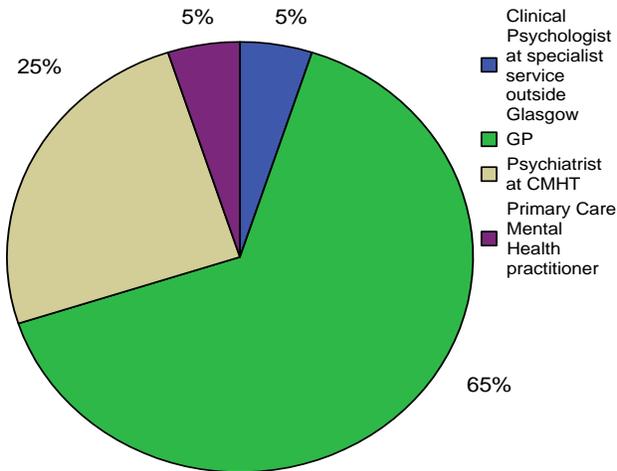


Fig. 5: Current status of patient:

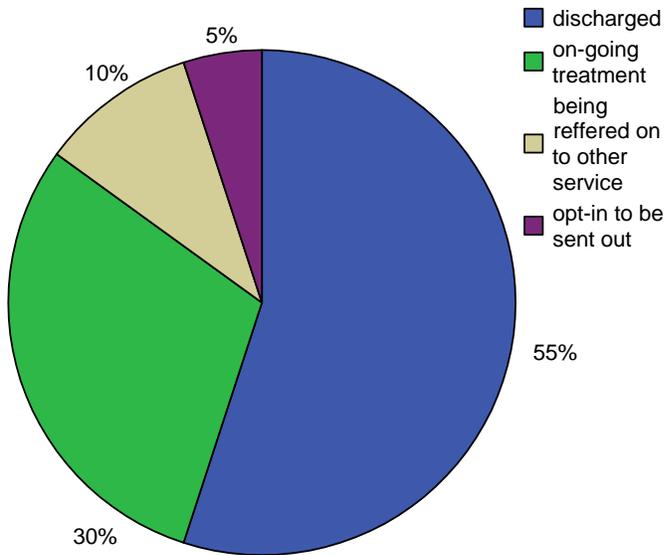
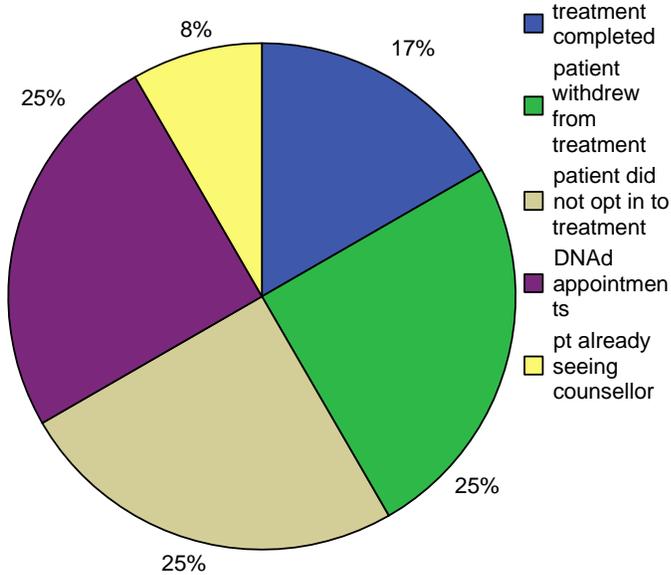


Fig.6: Reasons for discharge



CHAPTER TWO: SYSTEMATIC LITERATURE REVIEW

Evidence for social skills deficits following traumatic brain injury in childhood: A systematic review of the literature

Prepared in accordance with the guidelines for Brain Injury (Appendix 2.1)

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Abstract

Objectives: To review the evidence for social skills deficits following traumatic brain injury (TBI) in childhood and investigate the quality of published research in the area.

Method: Electronic search of 5 databases and hand searches of key journals and the reference sections of key papers. Studies that included children aged 0-18 years and compared all categories of head injury (mild, moderate and severe) and used a specific measure of social skills are included.

Main Outcomes & Results: Eleven studies are included and rated according to methodological criteria. Three were rated as being of high methodological quality, six were rated as moderate and two were rated as being of low quality. All of these studies found evidence for areas of social skills deficit following paediatric TBI.

Conclusions:

The studies in this review suggest that pragmatic language ability, theory of mind and executive functioning can be negatively affected by TBI and hence may have an impact on social problem solving and social functioning.

Introduction

Traumatic brain injuries (TBI) are extremely common and are the leading cause of disability and mortality in childhood. It is estimated that in the UK alone, 150,000 children a year attend hospital as a result of head injuries [1]. Approximately 81% of TBIs are mild, 8% moderate, 6% severe and 5% fatal [2]. Survivors face a number of negative outcomes. Cognitive deficits can include impairments of intelligence, memory, language, non-verbal skills and executive functioning. Behavioural consequences include impulsivity, irritability, agitation, confusion, apathy and emotional lability. Academic achievement, school performance and adaptive abilities have also been documented to be detrimentally effected [3]. Little is known about the impact of TBI on children's social functioning however research with adults describes a variety of social problems, including being judged less likeable and less socially skilled than non-head injured peers [4].

Social competence is a multi-faceted construct and researchers frequently disagree over precisely how it should be defined. However, agreement exists about the importance of higher order executive functions in successful social interactions [5] and this forms the basis for models of Social Information Processing (SIP). These models suggest that successful social performance depends on several component skills being deployed in an integrated manner. It is proposed that individuals are subject to a plethora of internal and external cues in each social situation they encounter. The success of all interactions depends on how the information encountered is processed and acted upon [6]. Crick & Dodge's SIP model [6] identified 6 discrete social information processing steps:

1. Encoding of external and internal cues
2. Interpretation and mental representation of those cues
3. Clarification or selection of a goal
4. Response access or construction
5. Response decision, and
6. Behavioural enactment

It is easy to imagine the potentially negative impact of TBI on this process. For example, attentional deficits may result in individuals failing to notice, encode and interpret the full range of internal and external cues available to them in social situations.

The ability to fully interpret and understand the underlying meanings of interactions is an essential part of social success. For this reason, two additional factors should be considered alongside the above model. The first relates to the impact of language function on social communication [5]. Research shows that children with TBI have difficulty generating narratives, producing speech acts that express intentions and judging communication adequacy [7]. Such difficulties may occur as the result of aphasia, acquired language impairments resulting from damage to specific areas of the brain. The impact of such difficulties on social functioning is potentially far reaching. The second factor to be considered alongside the SIP model [6] is theory of mind [8], the ability to make social inferences and accurately predict the mental states and emotions of others. Recent studies show that TBI causes declines in ToM ability in adults [9] and children [10].

Hence, research investigating social information processing and the relative contribution of language ability and theory of mind skills in successful social performance will be the main focus of this systematic review of the literature.

Question:

Do children show social skills deficits following traumatic brain injury?

Objectives:

- To investigate whether children who have suffered traumatic brain injuries show deficits on measures of social skills
- To investigate the quality of published research into social skills deficits following childhood head injury.

Methods

Identification of Papers – Electronic Databases:

The following electronic databases were searched using the terms and strategy outlined below:

- All Evidence Based Medicine reviews (Cochrane Database of Systematic Reviews, ACP Journal Club, Database of Abstracts of Reviews of Effectiveness, and Cochrane Central Register of Controlled Trials)
- CINAHL 1982 to March week 4 2007
- EMBASE 1980 to 2007 Week 14

- Ovid Medline (R) 1950 to March Week 3 2007
- PsychINFO 1967 to March Week 4 2007

Search Strategy

A search was conducted for the following terms:

- ‘head injur\$', ‘brain injur\$', ‘TBI’, ‘ABI’ or ‘head trauma’
- ‘social skills’, ‘social function\$', social behaviour’, ‘social knowledge’, ‘social communication’, ‘social problem solvin\$', social deficits’, ‘social information process\$', social difficulties’ and ‘theory of mind’
- ‘pediatric’, ‘paediatric’, ‘chil\$', ‘infan\$’ or ‘adolescen\$’

\$ represents the unlimited right truncation command, which means that the search will identify all words beginning with a common term e.g. chil\$ will identify, child, childhood, children etc. The results of the searches were combined using ‘AND’. The results of this final electronic search were then subject to the inclusion and exclusion criteria described below.

Hand Search of References

The reference sections of papers identified by the electronic database search were checked to identify any further articles of relevance. Papers identified in this way were systematically excluded on the basis of title, abstract, or full publication where necessary. Issues of the journal, Brain Injury were hand searched from January 1990 up until March 2007 in an attempt to identify any further articles of relevance.

Inclusion/Exclusion Criteria

Articles identified by the above search strategies were initially screened for relevance using the following criteria

Primary criteria:

Exclusion

- Review article, case study or dissertation abstract
- Not available in the English language
- Included only a general measure of adaptive functioning which did not focus specifically on social skills

Inclusion

- Included individuals aged 0-18 years
- Included a mild, moderate and/or severely brain injured group
- Included a specific assessment of social skills (as described by the researchers)

Secondary criteria

Studies meeting these initial criteria were then subject to the following secondary criteria:

- (a) Comparing performance of children with TBI to a normally developing control group, or a group of children without a primary diagnosis of TBI or congenital brain abnormalities *and/or*
- (b) Did not focus specifically on impairments in discourse and language function as a means of identifying social competency.

Search Results:

2394 articles were identified by the electronic database search (with duplicates removed). Of these, 78 appeared relevant on the basis of their title and abstracts were obtained. The abstracts of 49/78 suggested that they might be appropriate, and were written within the specified review period (January 1990- March 2007). These papers were obtained and checked for relevance. 20 of the 49 met the primary inclusion criteria and 11 out of the 20 met the secondary inclusion criteria. Searching the reference lists of relevant papers and hand searching the journal Brain Injury did not identify any further articles. Thus a total of 11 papers were included in this review [3, 10-19].

Quality Rating Criteria

The rating criteria were developed to compare three aspects of study design: selection and recruitment methods, participant characteristics, and assessment techniques. A total of 15 items were included in the rating criteria checklist, each with a score from 0-3 giving a range of scores from 0-45 (see Table 1). All of the studies included in this review were evaluated by two independent raters, who both gave each study an overall score. Agreement between the two raters was 73%. Discrepancies were resolved through discussion and adjustment of the criteria. Scores assigned to each included study were expressed as a percentage of this maximum score. To give a general indication of study quality, these percentages were arbitrarily classified as high (>75%), moderate (50-74%), low quality (<49%).

[Insert Table 1 about here]

Selection of Systematic Review Quality Criteria

The quality criteria questions for this review were chosen to address factors generally considered important in research, and also factors specifically relevant to the topic under investigation. The SIGN (Scottish Intercollegiate Guidelines Network) Methodology Checklist [20] was consulted and examples of criteria questions were modified to apply more directly to the studies under investigation. The inclusion of each quality criteria question is justified in Appendix 2.2. All quality criteria questions included in this review are shown below:

External Validity

Qu.1. What was the source of recruitment for the experimental group?

Qu. 2 What was the source of recruitment for the control group?

Qus.3 & 4. How were participants in the experimental/control group recruited?

Qu.5 Was there any financial or other incentive for participation?

Internal Validity

Qu.7 What was the range of severity of injury in the experimental group?

Qu.8 What was the mean time since injury in the experimental group?

Qus.9&10 Were participants in the experimental/control group excluded due to previous head injuries?

Qu.11 Were participants with in the experimental or control group excluded due to pre-existing neurological disorder?

Additional Criteria of Relevance

Qu.6 Was a sample size calculation performed?

Qu.12 What measures were used to assess caseness in the experimental TBI group?

Qu.13 Were measures used to assess caseness in the control group adequate?

Qu.14 Was the main assessment measure previously published or devised by the author?

Qu.15 From whom was information gathered during assessment?

Results

Of the 11 studies included, three were rated as high quality [4, 11, 13], six as moderate quality [10, 12, 14, 15, 16, 17] and two as low quality [18, 19] (see Table 2).

[Insert Table 2 about here]

Evidence for social skills deficits following paediatric TBI

The full range of strengths and weaknesses for each study, according to the rating criteria, are outlined in Appendix 2.3. Table 3 provides the characteristics and main findings of the 11 included studies.

[Insert Table 3 about here]

High Quality Studies

- **Janusz, Kirkwood, Yeates & Taylor (2002) – 82%**

This study compared children with TBI to orthopaedic controls. They were consecutive referrals to hospital. The groups were well matched, increasing the likelihood that any differences between them are due to the nature of injury. The main measure (the Interpersonal Negotiations Strategy Interview) is a valid and reliable tool for assessing social problem-solving [21]. Children were asked to consider what they would do in hypothetical social situations, hence providing researchers with a ‘real life’ assessment of their social competency. Methodological limitations were few. Previous TBI was not an exclusion criterion for the experimental group. Hence any differences between the two groups could be due to the cumulative effects of multiple TBI. Despite this, the results remained convincing.

- **Andrews, Rose & Johnson (1998) – 80%**

A strength of this study was that strict exclusion criteria, including a history of TBI or neurological disorder, were applied to both groups (TBIs and normal controls) reducing the number of potentially confounding variables. Furthermore, the experimental group were consecutive admissions to hospital, making it a valid sample of the paediatric TBI population. Controls were sourced from local schools and were self-selected, probably resulting in the majority of control participants coming from highly motivated or academic backgrounds and as such would be poor controls for typical TBIs. In addition the control group had not been hospitalised following traumatic injury and it could be argued that some qualitative differences

existed between the two groups before testing began. All measures administered were questionnaires, which increases the likelihood of bias and inaccurate reporting on the part of the participants [22] however all were reliable and well-established measures commonly used in research. Future studies could utilise a specific measure of post-traumatic symptomatology, for example the Children's Impact of Events Scale [23] in order to develop the theorised link between PTSD-type reactions and social skills following TBI.

- **Ganesalingam, Sanson, Anderson & Yeates (2006) – 76%**

Exclusion criteria for both groups of participants were strict, minimising the potential for confounding variables to affect results. Data was gathered from children, parents and teachers, and multi-informant data collection is considered optimum in this area of research [24, 25]. A drawback was that the control group were self-selected and recruited from the community. More importantly, the control and experimental participants were recruited from different (albeit culturally similar) countries. As a result it is likely that qualitative differences existed between the two groups to confound and influence outcome and this has a major impact on the validity of the study as a whole, despite good methodological practice being demonstrated in other aspects of its design. Despite this, the themes identified are worthy of follow-up, using a more closely matched control group, perhaps from an orthopaedic setting.

Moderate Quality Studies

- **Yeates, Swift, Taylor, Wade, Drotar, Stancin & Minich (2004) – 73%**

Like Janusz et al [4], a strength of this study was that it utilised the INS interview which gathered data on how children would react to 'real life' social situations. Other strengths were that sample sizes were large and orthopaedic controls were used. It is potentially important that all participants experienced traumatic injury and hospitalisation because there is evidence to suggest that children who sustain traumatic injuries may be characteristically different, in terms of impulsivity and inattention, to uninjured children [26]. A drawback was that previous TBI was not an exclusion criterion for the experimental group. The marked difference between the two groups could in part be due to the cumulative effect of multiple TBI. Also all participants were self-selected. Overall, however, the suggestion that pragmatic language and executive functioning influence social problem solving is convincing.

- **Snodgrass & Knott (2006) – 71%**

Although sample sizes in this study were small, post-hoc power analyses confirmed that reported differences accurately reflected trends in the data. Notably, participants were self-selected, and may have come from more educated or more motivated families than found in the populations under investigation. Furthermore, despite previous neurological disorder and TBI being exclusion criteria for the control group, experimental participants were not excluded for previous TBI. Data was collected from child participants only and not from parents or teachers, and potentially could give an inaccurate impression of functioning [24]. However, the measures used were well-established valid and reliable ways of measuring theory of mind, a crucial aspect of successful social communication [8]. The experimental and control groups were tested in different settings; the former at school and the latter within their homes. The relatively more stressful school setting may have meant that the experimental group experienced more anxiety than controls and this could have detrimentally affected their performance over and above effects of TBI. Despite receiving a moderate quality rating, this study was well designed and its results look convincing and worthy of further investigation.

- **Bohnert, Parker & Warschausky (1997) – 62%**

This study is unique as social competency was assessed via data on friendship networks and frequency of peer contacts. This naturalistic, almost observational way of assessing social competency reduced the likelihood of response bias. Notably, the majority of experimental participants had severe TBI, hence it cannot be assumed that the results would hold true for the TBI population. The greatest limitation was that a ‘real life’ control group was not used in the course of this study. Instead, social adjustment data from a large pre-existing data set of non-injured children was utilised. The authors gave no data on where or how the control data was originally gathered, and whether participants had been subject to exclusion criteria. Stark qualitative differences may have existed between the two groups, over and above head injury status, which could account for differences shown in results. Despite these limitations, assessment of social competency through peer networks and interactions remains worthy of follow-up.

- **Lewis, Morris, Morris, Krawiecki & Foster (2000) – 60%**

The control group was recruited from a pre-existing research pool possibly comprised of more motivated research-oriented individuals than the population at large. The experimental group was relatively heterogeneous and included children with brain injuries of multiple aetiologies

such as tumours and encephalitis. Therefore differences between the two groups could be accounted for by a multitude of factors. Similarly, the authors did not state what exclusion criteria (if any) experimental participants were subject to. The Social Knowledge Interview was the main measure used to assess social competency, hence the authors were able to directly assess social skills without relying on subjective reports which may be subject to bias and demand characteristics. Notably, the SKI has not been used in many other studies and little information is available about its reliability and validity. However, it looks similar to the INS interview which is well-established and popular [4]. Despite seeming relatively robust at first glance, further investigation revealed methodological problems which limit the study. The conclusions, however, remain interesting and worthy of follow-up.

- **Turkstra, Dixon & Baker (2004) – 60%**

The main measure was specifically devised by the authors and lacks data on validity and reliability. Despite this, the videotape format made it possible for researchers to deduce how participants would interpret and react to real life social situations, and therefore could be considered one of this study's strengths. Another strength was that participants were excluded from the TBI and normal control groups if they had a previous neurological history. However, participants were not excluded from either group for having a previous TBI. Furthermore, relatively small numbers of experimental participants were used and post-hoc power analysis suggested that more differences could have been found with larger sample sizes. Also, participant age range was 13-22 years, which potentially means that head injured individuals had developed a full range of social competencies before they sustained their injury, so any impairments to these abilities are likely to follow the adult pattern of initial deficit followed by recovery. Despite these drawbacks, this study's results remain convincing, and are very similar to results generated by other studies included in this review [17, 18, 10] adding further credibility.

- **Warschawsky, Cohen, Parker, Levendosky & Okun (1997) – 53%**

The results replicate the findings of other studies included in this review, and are intuitively convincing. However there were several limitations. All participants were self-selected suggesting they represent a highly motivated section of their populations. Also the authors did not state whether any participants were excluded for previous TBI or neurological disorder, so there may be many potentially confounding variables within the data set. Data was collected from child participants only however the Social Problem-Solving Measure has been shown to

be a reliable and valid tool for assessing social competency. Overall, the results generated remain interesting and have the potential to add to the literature, despite flaws in the design. Future replications could easily increase the quality rating of this study by making small changes to the design in line with the observations presented above.

Low Quality Studies

- **Turkstra, McDonald & DePompei (2001) – 47%**

This study replicates the finding of several other higher quality studies [10, 16, 17]. Significant differences were found despite relatively small sample sizes however post-hoc analyses suggested that other potentially important effects could have been shown with larger sample sizes. All participants were self-selected, few details are given, and previous TBI or neurological disorder was not part of the exclusion criteria. Hence a number of confounding factors may have influenced the data. The main measure used was devised by the authors and it is notable that participants from both groups frequently made errors on certain stimuli, perhaps suggesting the measure was slightly ambiguous in parts. Use of a more well established, reliable and valid tool may have helped maintain internal validity. The measure created by the authors however, had the potential to capture social understanding in a naturalistic way, optimum practice in this area of research. Follow-up studies modified to address the above issues have the potential to make a significant contribution to the literature.

- **Pettersen (1991) – 44%**

This study had many methodological weaknesses. All participants were self-selected and all were given monetary incentives for taking part. This might have attracted participants of a lower socio-economic status than would be representative of the wider population. Also the range of severity of TBI was not outlined which limits generalisability, however the fact that coma duration was taken into account would suggest that the majority were severe. Furthermore, experimental participants were not excluded on the basis of previous neurological disorder or TBI hence differences between the two groups could have been due to the effects of multiple head injuries or neurological conditions. Many of the measures were adapted from a conglomeration of pre-existing stimuli by the author to fit the needs of the present study. These modified and adapted materials are likely to have dubious reliability and validity. On a positive note, the control group in this study came from an orthopaedic setting and therefore had traumatic injury and hospitalisation in common with their head-injured peers. They were also excluded for previous TBI or neurological condition, limiting

potentially confounding variables. This study was described as an ‘exploratory investigation’ and hence is perhaps most appropriately thought of as a pilot study from which more methodologically robust studies might spring, rather a robust piece of research making an important contribution to the literature.

Quality of research into social skills deficits following paediatric head injury

The quality of the studies included in this review are varied. Even those rated as being of high methodological quality have weaknesses in design that potentially limit the conclusions drawn. However, for most of the studies, the drawbacks did not relate to ways in which social competency was assessed, as only one study relied solely on the use of questionnaire measures [11] and the rest used inventive and naturalistic ways of assessing how children might respond to social dilemmas. Most studies dropped points in the rating criteria because of poor methodological rigour in more basic areas of the studies’ design. A common flaw was for studies to not include previous TBI or neurological disorder in their exclusion criteria for both or either group of participants. Furthermore, only 3 out of the 11 studies [4, 12, 19] recruited their control group from a clinical setting. It was also commonplace for participants to be self-selected and for sample sizes to be small and unsupported by power calculations. However, 9 out of the 11 studies drew conclusions that remained convincing even when design weakness was taken into account. Although not methodologically exemplary, the majority of the studies included in this review added something to literature on the effects of paediatric TBI on social functioning.

Discussion

The majority of studies included in this review found that head injured children showed areas of deficit in their ability to process social information, which negatively impacts on social skills. Several strong lines of evidence were uncovered. Firstly, it was suggested that TBI has a detrimental effect on children’s ability to make accurate inferences about the beliefs, desires and intentions of those with whom they interact, as shown by significantly poorer performance, than normally developing peers, on first and second order theory of mind measures [e.g. 10,16, 18]. Two of the studies which showed ToM deficits existed in children with TBI were categorised as being of moderate quality and one as Low quality however despite methodological limitations the results remained convincing. A further two studies, [4, 12], rated as being of High and Moderate methodological quality respectively, highlighted the potential impact on social problem-solving skills of pragmatic language ability in children

with TBI. These papers convincingly suggested that children with TBI have difficulty bridging the gap between what a speaker literally says and what is meant or implied. Theory of mind ability and understanding of pragmatic language are closely related, as both require children to make inferences or assumptions based on the information directly presented to them during a social interaction. Impaired ability in either of these domains is likely to negatively impact on social skills. Furthermore, a recent and credible study [10] identified TBI children as being less able to accurately identify facial expressions of emotion, which could also contribute to poor social functioning. This particular deficit may have its roots in impaired theory of mind [8] or equally could be explained by another strong theme generated by this review which suggests that TBI impacts negatively on attention, processing speed and capacity for the manipulation of information in working memory [17]. It was also suggested that TBI children showed deficits on tests of executive function, that is, planning, organising, decision making and regulation of thoughts, behaviours and emotions [12, 13].

The results of this review therefore suggest that deficits in areas such as ToM, pragmatic language and emotion recognition, as well as difficulties with attention, working memory and executive functioning have a considerable impact on successful social functioning following TBI. It is likely that all of these factors intertwine to cause reduced social competency, as they do not appear to be mutually exclusive [27]. It is easy to imagine the detrimental effect that each of these factors would have on social information processing models as championed by Crick & Dodge [6]. Difficulties in the areas outlined above may also explain some of the other findings uncovered in this review, for example that children with TBI were rated as exhibiting more aggression, anti-social behaviour and having more peer problems than controls [11,13, 14]. However, it is important to consider that such problematic behaviour could be attributed to the trauma of having experienced an injury and subsequent period of hospitalisation. Hence the potential contribution of PTSD-type symptoms, or simply elevated anxiety levels following traumatic injury, should be kept in mind in future research [11]

Limitations

A limitation of this systematic review of the literature is that the included studies rarely provided appropriate data on means and standard deviations from which effect sizes could be calculated. This meant that a meta-analysis could not have been carried out and conclusions could not have been drawn about the relative magnitude of deficits in different areas of 'social intelligence' on overall social competency and functioning. Furthermore, with the potential

impact of pragmatic language ability on social competency, it would perhaps have been useful for this review to have included studies which looked specifically at the impact of aphasia and specific impairments of discourse and language functioning alongside the more general studies of social problem-solving.

Conclusion

This review provides strong evidence to suggest that deficits in several intertwining areas of 'social intelligence' negatively impact on children's social skills, following TBI. However, it is acknowledged that this area of research remains in its infancy, and many of the studies have methodological weaknesses. In terms of directions for future research in the area, it is notable that only one study included in the present review [10] paid attention to which specific areas of the brain were damaged following TBI. It is viable to suggest that a focus on lesion localisation in future research may add significantly to the growing understanding of outcomes following traumatic injury to the developing brain. In general, more extensive investigations of a high methodological quality are needed to follow-up on, and consolidate, the themes uncovered by this review. However, despite their shortcomings the papers included in this systematic review of the literature have considerably advanced understanding of the social skills deficits following paediatric and adult TBI.

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Table 1 Quality Rating Criteria

Selection & Recruitment	
1. Source of TBI population	<ul style="list-style-type: none"> • Clinical setting (3 points) • Non-clinical/community setting (1 point) • Not stated (0 points)
2. Source of control group population	<ul style="list-style-type: none"> • Clinical setting (3 points) • Non-clinical/community setting (2 points) • Not stated (0 points)
3. Recruitment of TBI participants	<ul style="list-style-type: none"> • Consecutive referrals (3 points) • Convenience sample (2 points) • Self-selected (1 point) • Not stated (0 points)
4. Recruitment of control participants	<ul style="list-style-type: none"> • Consecutive referrals (3 points) • Convenience sample (2 points) • Self-selected (1 point) • Not stated (0 points)
5. Financial/other incentives	<ul style="list-style-type: none"> • None stated (3 points) • Given to some groups (2 points) • Given to all (1 point)
6. Sample size calculation	<ul style="list-style-type: none"> • Performed and achieved (3 points) • Performed but not achieved /performed post-hoc (2 points) • Not performed/not stated (0 points)
Participant Characteristics	
7. Range of severity in TBI group	<ul style="list-style-type: none"> • Homogeneous groups – mild, moderate or severe (3 points) • Heterogeneous groups/mixed severity/generic ‘TBI’ group (2 points) • All severities and non-TBI included (0 points)
8. Mean time since TBI	<ul style="list-style-type: none"> • Over 3 months (3 points) • Less than 3 months (1 point) • Not stated (0 points)
Exclusion Criteria	
9. Were experimental participants excluded for previous TBI?	<ul style="list-style-type: none"> • Yes (3 points) • No (1 point) • Not stated (0 points)
10. Were control participants excluded for previous TBI?	<ul style="list-style-type: none"> • Yes (3 points) • No (1 point) • Not stated (0 points)
11. Were any participants excluded for previous neurological disorder?	<ul style="list-style-type: none"> • Excluded in all groups (3 points) • Excluded in TBI group only (1 point) • Excluded in control group only (1 point) • Not excluded in any group/not stated (0 points)

Table 1 Quality Rating Criteria (continued)

Assessment Techniques	
12. Measures assessing caseness in TBI group	<ul style="list-style-type: none"> • PTA, GCS and LoC given (3 points) • PTA/GCS/LoC or mixture of (2 points) • Not stated (0 points)
13. Description of control participants	<ul style="list-style-type: none"> • Appears highly reliable – participants will be homogeneous (3 points) • Appears adequate – participants are likely to be homogenous (2 points) • Appears inadequate – not well described/participants likely to be varied (1 point) • Not stated (0 points)
14. Main assessment measure	<ul style="list-style-type: none"> • Previously published assessment measure (3 points) • Devised by author (1 point)
15. Information gathered from	<ul style="list-style-type: none"> • Child and parent/teacher (3 points) • Parent/teacher alone (2 points) • Child alone (2 points) • Not stated (0 points)

Table 2: Criteria ratings of the included studies

	Janusz et al (2002)	Andrews et al (1998)	Ganesalingam, et al (2006)	Yeates et al (2004)	Snodgrass et al (2006)	Bohnert et al (1997)	Lewis et al (2000)	Turkstra et al (2004)	Warschausky et al (1997)	Turkstra et al (2001)	Pettersen (1991)
1.Source – exp	3	3	3	3	3	3	3	3	3	3	3
2. Source - cont	3	2	2	3	2	1	2	2	2	2	3
3.Recruit- exp	3	3	2	1	1	2	0	2	1	1	1
4.Recruit – cont	3	1	1	1	1	2	2	2	1	1	1
5. Incentive	3	3	3	3	3	3	2	3	3	3	1
6. Sample size	0	0	0	0	2	0	3	2	0	2	0
7. Severity	2	2	2	2	2	2	1	2	2	2	0
8.Time	3	3	3	3	3	3	3	3	3	3	3
9. Exp-TBI	0	3	3	0	3	3	0	0	0	0	0
10. Contrl - TBI	3	3	3	3	3	0	0	0	0	0	3
11 Neurol	3	3	3	3	1	1	1	3	0	0	1
12 case - exp	2	3	2	2	2	2	2	2	2	0	0
13 details-control	3	1	1	3	1	0	2	0	2	0	0
14 measure	3	3	3	3	3	3	3	1	3	1	1
15 Info	3	3	3	3	2	3	3	2	2	3	3
Total	37 = 82%	36 = 80%	34 = 76%	33 = 73%	32 = 71%	28 = 62%	27 = 60%	27 = 60%	24 = 53%	21 = 47%	20 = 44%
Quality Rating	High	High	High	Mod	Mod	Mod	Mod	Mod	Mod	Low	Low

Table 3: Characteristics of studies included in the review (continued)

Study	Age range	Experimental group	Mean time since injury	Control group	Social skills measure/main measure	Source of data	Main findings
Janusz, Kirkwood, Yeates & Taylor (2002)	6-12 years	75 children with TBI: Mod (n=40), Severe (n=35)	4 years	46 children with orthopaedic injuries	<i>Child:</i> The Interpersonal Negotiations Strategies Interview. <i>Parent:</i> Child Behaviour Checklist and Vinelands Adaptive Behaviour Scales.	Child & parent	No differences between groups in ability to generate solutions to hypothetical social situations. TBI group less mature in their reasoning when selecting preferred responses & deciding how to evaluate them (independent of IQ). Suggested that social problem-solving strongly related to theory of mind skills and pragmatic language ability.
Andrews, Rose & Johnson (1998)	6-18 years	27 children with TBI: Mild (n=8), Mod (n=9), Severe (n=10)	1.5 years	27 normally developing children	<i>Child:</i> Coopersmith Self-Esteem Inventory & Children's Loneliness Scale <i>Parent:</i> Vinelands Adaptive Behaviour Scales & DeBlois Aggressive & Antisocial Behaviour Scales.	Child & parent	TBI group had significantly lower self-esteem and adaptive behaviour and higher scores on loneliness, maladaptive behaviour and aggressive/ antisocial behaviour as rated by parents. Suggested that post-traumatic stress reactions may account for a sizeable degree of reported social skills deficits following TBI, which were not found to worsen with increasing injury severity.

Table 3: Characteristics of studies included in the review (continued)

Study	Age range	Experimental group	Mean time since injury	Control group	Social skills measure/main measure	Source of data	Main findings
Ganesalingam Sanson, Anderson & Yeates (2006)	6-11 years	65 children with TBI Mod(n=33) Severe (n=32)	2-5 years	65 normally developing children	<i>Child:</i> 2 tests of cognitive self-regulation from Test of Everyday Attention for Children & a delay of gratification task <i>Parent:</i> Eyeberg Child Behaviour Inventory & Emotion Regulation Checklist. <i>Teacher:</i> Sutter-Eyberg Student Behaviour Inventory <i>Parent and Teacher:</i> Social Skills Rating System	Child, teacher & parent	Parents & teachers rated TBI children as having more problematic behaviour and poorer social skills. TBI children showed greater deficits in cognitive, emotional and behavioural self-regulation than controls correlating with parent and teacher ratings of social competence. Differences between the two groups were most pronounced on tests of emotional self-regulation.
Yeates, Swift, Taylor, Wade, Drotar, Stancin & Minich (2004)	6-12 years	109 children with TBI: Mod (n=56), Severe (n=53)	4 years	80 children with orthopaedic injuries	<i>Child:</i> Interpersonal Negotiation Strategies interview & tests of executive functioning & pragmatic language. <i>Parent:</i> Social Competence & Social Problems subscales from Child Behaviour Checklist and the Socialisation scale from Vinelands Adaptive Behaviour Scales	Child & parent	TBI children performed more poorly on the social problem-solving measure, and were rated as being significantly less socially competent, than orthopaedic controls. Deficits in pragmatic language ability and executive functioning hypothesised to account for the poor performance of the TBI group

Table 3: Characteristics of studies included in the review (continued)

Study	Age range	Experimental group	Mean time since injury	Control group	Social skills measure/main measure	Source of data	Main findings
Snodgrass & Knott (2006)	6-12 years	12 children with TBI and frontal lobe damage: Mod (n=3) Severe (n=9)	4 years	12 normally developing children	<i>Child:</i> The Sally Ann Test (basic theory of mind), The Deception vs. Sabotage 'One Box' Test (advanced theory of mind) & the children's version of the Reading the Mind in the Eyes Test (advanced theory of mind). A basic emotion recognition task was also included.	Child only	Children with TBI performed significantly less well on the advanced ToM measures and on a measure of basic emotion recognition. No differences between groups were found on the basic ToM test. Suggested that frontal lobe injury in particular may lead to deficits in advanced ToM skills, and perhaps also in behavioural response inhibition.
Bohnert, Parker & Warschusky (1997)	8-16 years	22 children with TBI: Severe (n=15)	3.5 years	22 matched controls. No further information given	<i>Child:</i> Peer Social Support Network Diagram & Friendship Quality Questionnaire. Asked to provide data on the frequency of contact with best friend & rate a list of issues in terms of importance <i>Parent:</i> Ratings of Child Competence measure.	Child & parent	TBI children rated as having more difficulty with peer relationships than controls. TBI children showed insight into their difficulties, as they cited losing friendships as a major (albeit age appropriate) concern. In general however, friendships and peer networks were comparable between the two groups.

Table 3: Characteristics of studies included in the review (continued)

Study	Age range	Experimental group	Mean time since injury	Control group	Social skills measure/main measure	Source of data	Main findings
Lewis, Morris, Morris, Krawiecki & Foster (2000)	6-12 years	31 children with brain injuries of multiple aetiologies: TBI (n=12), brain tumour (n=15), CVA (n=2), encephalitis (n=2)	1.5 years	31 normally developing children	<i>Child</i> : Social Knowledge Interview (SKI) <i>Parent</i> : Child Behaviour Checklist and Vinelands Adaptive Behaviour Scale.	Child & parent	No differences were found between the ability of the two groups to generate effective positive responses to hypothetical social situations. Trends suggested the TBI group generated more highly assertive responses than controls, which could be perceived as aggressive and socially unacceptable by their peers
Turkstra, Dixon & Baker (2004)	13-22 years	23 adolescents with TBI: Mod (n=6) Severe (n=17)	At least 6 months	48 normally developing adolescents	<i>Child</i> : Shown videotaped vignettes. Asked questions regarding behaviours necessary for good social interaction. Also asked first & second order theory of mind (ToM) questions requiring inferences about mental states and emotions of the actors in the vignettes. Also completed a questionnaire on important social behaviours.	Child only	TBI group was significantly less able to recognise behaviours necessary for good social interactions. No differences were found between groups on first order ToM tasks. TBI group performed significantly less well on second order ToM task, perhaps due to the increased demand on working memory.

Table 3: Characteristics of studies included in the review (continued)

Study	Age range	Experimental group	Mean time since injury	Control group	Social skills measure/main measure	Source of data	Main findings
Warschawsky Cohen, Parker, Levendosky & Okun (1997)	7-13 years	14 children with TBI: Severe (n=8)	9 months	49 normally developing children	<i>Child</i> : Social Problem-Solving Measure	Child	TBI children generated significantly fewer solutions to hypothetical social scenarios involving their peers, especially those that involved joining in peer activity. TBI group overall generated fewer positive assertive solutions, and more relevant but passive solutions. Trends hypothesised to be accounted for by deficits in attention span, processing speed and working memory in the TBI group.
Turkstra, McDonald & DePompei (2001)	13-21 years	10 adolescents with TBI: Mod (n=2), Severe (n=8)	At least 6 months	60 normally developing adolescents	<i>Child</i> : Shown videotaped vignettes of social interaction. Asked questions to assess first and second order theory of mind <i>Parent</i> : Behaviour Rating Inventory of Executive Function	Child & parent	TBI group made similar errors of emotional recognition as controls, albeit significantly more frequently. TBI group had significantly more trouble making inferences about the emotional states of others (first order theory of mind) and making guesses about the beliefs and inferences of others (second order theory of mind).

Table 3: Characteristics of studies included in the review (continued)

Study	Age range	Experimental group	Mean time since injury	Control group	Social skills measure/main measure	Source of data	Main findings
Pettersen (1991)	5-16 years	20 children with TBI: No further information given.	1 year	20 children with orthopaedic injuries	<i>Child:</i> Emotional Scenes task, Emotional Vignettes task, recognition of facial expressions of emotion & facial expressions in general <i>Parent:</i> A 28-item questionnaire, devised by the authors, about their child's social behaviour	Child & parent	TBI children were less able to correctly interpret facial expressions of emotion in general and were more likely to make errors of opposite polarity. Duration of coma significantly related to performance on these tasks. Also rated as exhibiting less appropriate social behaviours than controls. Strong trend in the data suggested that deficits in emotion interpretation and recognition predicted parental reports of social skills and competency.

CHAPTER THREE: MAJOR RESEARCH PROJECT PROPOSAL

An investigation of social knowledge and communication in children under 13 years, following moderate to severe Head Injury.*

Name: Ailish Flatley

Academic Supervisor: Professor Tom McMillan

Field Supervisor: Dr Liam Dorris

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

* The original proposal had to be amended in line with the recommendations of the Primary Care Ethics Committee, and with regards to the availability of research participants. A copy of the original proposal submitted to, and passed by the Doctorate in Clinical Psychology training course is included as Appendix 3.1

Summary:

The aim of this study is to investigate whether moderate to severely head injured children are less able to recognise emotion in others and have poorer social skills as rated by teachers and parents. Furthermore, this study also aims to investigate whether there is an association between emotion recognition and social competence amongst the paediatric head injured population.

Using a between-groups design, it is hypothesised that children with moderate to severe head injury will perform less competently on the children's version of the "Reading the Mind in the Eyes" test (Baron-Cohen et al 2001) and the Matson Evaluation of Social Skills with Youngsters (Matson et al 1983), than a non-head injured control group.

The study will be carried out on a sample of children from 6 to 13 years of age who attended the Royal Hospital for Sick Children in Glasgow following a moderate or severe head injury. The control group will consist of non-head injured children, who will be closely matched to the experimental groups in terms of age, sex and score on the British Picture Vocabulary Scale-Version II (BPVS II, Dunn et al 1997).

Introduction:

Head injury is extremely common in childhood. The majority of head injuries sustained by children are mild and therefore result in few functional sequelae. However, children who sustain relatively more serious head injuries may experience on-going cognitive and behavioural deficits. The causes of childhood head injury are diverse and, similar to the adult population the majority of injuries are related to road traffic accidents (Anderson, Northam, Hendy & Whennall 2001). However, amongst the paediatric population there is a higher incidence of head injuries resulting from falls, pedestrian accidents and non-accidental injury (for example as a result of abuse) than in the adult population. The circumstances leading to head injury in children vary with age and developmental level; with children under 3 years of age having the highest incidence (Anderson et al 2001) of head injuries. The nature of the injury also varies with age and developmental level. For example, infants are more likely to experience head injuries as a result of falls or child abuse. Pre-school children are at high risk of falls and pedestrian accidents, due to the high activity level of this age group. Adolescents and school-aged children, on the other hand, frequently sustain head injuries as a result of sporting, cycling or pedestrian accidents. Research suggests that fatalities decrease as age

increases, and that boys are more likely to sustain head injuries than their female counterparts (Anderson et al 2001). Also, several research studies have suggested that traumatic head injuries are more likely to occur amongst socially disadvantaged families, families where there is unemployment and emotional disturbance, and are likely to occur as a result of parental neglect and poor supervision (Anderson et al 2001).

A number of children who sustain head injury are hypothesised to be a “self-selecting” group (Middleton 2001). It was found that children with pre-existing concentration difficulties or who exhibited impulsive behaviour were at heightened risk of sustaining an injury to the head or elsewhere (Light, Asarnow, Satz, Zaucha, McCleary & Lewis 1998). Furthermore, Middleton (2001) suggested a higher incidence of pre-morbid behaviour difficulties amongst head-injured children. Hence, post-injury behavioural problems may be at least partially explained by these pre-existing difficulties (Ponsford, Willmott, Rothwell, Cameron, Ayton, Nelms, Curran & Ng 1999). Therefore, it has been suggested that the relationship between a head injury and post-injury behavioural problems cannot be assumed to be a causal one.

There is no doubt in the literature that moderate to severe head injury leads to a range of functional impairments. For example, depressed IQ is commonly reported following relatively more severe head injuries. Interestingly, studies have shown that even immediately post-injury, verbal IQ remains largely unaffected – potentially suggesting that “crystallised” knowledge (such as general knowledge or knowledge of words) may be less vulnerable to the negative effects of head injury. Performance IQ appears more likely to be affected and scores may decrease immediately post-injury and in the longer term (Anderson et al 2001). Taken together, the above findings could suggest that “fluid” skills (such as problem solving, reasoning, speed of processing and motor coordination) are more prone to negative outcome following head injury.

Despite research suggesting that “fluid” skills may be particularly vulnerable following head injury, previous research on neuropsychological outcomes has paid relatively little attention to the relationship between head injury in children and functional outcomes such as social knowledge and communication abilities or the ability to maintain friendships. This is perhaps surprising as emotional, social and behavioural disturbances are documented to occur in up to 30% of head injured children, and cause high levels of distress (Anderson, Catroppa, Haritou, Morse & Rosenfeld 2005). Furthermore, evidence from the adult literature suggests that

individuals who have experienced a traumatic head injury perceive social functioning as the most critical predictor of their quality of life (Warschausky, Argento, Hurvitz & Berg 2003). Thus it is viable to suggest that the attitudes of children with head injuries would echo this finding.

Previous studies of outcome following head injury have frequently focused on injuries sustained by older children or adolescents; individuals who are likely to have a range of established cognitive, behavioural and social skills (McKinley, Dalrymple-Alford, Harwood & Fergusson 2001). This older age group would arguably show a response to head injury that would follow the adult pattern of initial deficit followed by recovery. This fails to take into account the possibility that, as younger children are experiencing on-going active developmental change, the effects of a head injury in this population may be exacerbated through interactions with developmental processes. Therefore, in the longer term children with head injuries may be less able than their peers to acquire developmentally appropriate social skills.

Social competence is a complex construct involving many discrete skills that must be deployed in an integrated way in order to accurately interpret the behaviours of others and respond appropriately (Lewis, Morris, Morris, Krawiecki & Foster 2000). Haritou et al (1997 as cited in Anderson et al 2001) reported that preschool children with severe head injury produced less conversation and made more errors in conversation including poor topic maintenance, inappropriate turn-taking and inappropriate responses than normal controls. This could suggest that the head injured group were less socially competent than their non-head injured counterparts. Furthermore, in a study looking at solutions to hypothetical social scenarios, Warschausky et al (1997, as cited in Warschausky et al 2003) found that children with head injuries were relatively less assertive in their responses to hypothetical scenarios, in which they were asked how they might break into an ongoing peer activity, than an age-, sex-, socioeconomic status- and IQ-matched sample of their non-injured peers. The literature also suggests that the parents of head injured children frequently report that their children lack insight and appear insensitive to the needs and feelings of others. This may lead to difficulties in the classroom; head injured children often lose their past friends and peer group status and have difficulty integrating themselves into new groups of friends (Middleton 2001).

An important aspect of social competence is the ability to make inferences about the mental states of others, and use this to predict or explain their behaviour – so-called “Theory of Mind”. In order to accurately infer what another person is thinking or feeling one must be able to recognise and interpret the emotions communicated in social interactions. In a study with head injured adults (Havet-Thomassin, Allain, Etcharry-Bouyx & Le Gall, 2006) participants were asked to make inferences about the mental states of others by interpreting photographs showing only the eye-region of the face - the “Reading the Mind in the Eyes” test (Baron-Cohen, Wheelwright, Hill, Raste & Plumb 2001). Use of this measure has proved to be a reliable and valid way of assessing social intelligence or Theory of Mind in adults (Baron-Cohen et al 2001). Havet-Thomassin et al (2006) found that the severely head injured participants showed significantly impaired theory of mind abilities – they were unable to make accurate inferences about the mental states of others. Children typically develop theory of mind by the time they are six years old and several studies have already confirmed the link between ability to decode and recognise facial expressions, and social competence in children (Kupferberg, Morris & Bakeman 2001). Thus, following on from the findings of Havet-Thomassin et al (2006), the present study proposes that suffering a relatively severe head injury in childhood could either prevent optimal development of theory of mind, or impair existing abilities. It is proposed that this may partly account for the reduction in social competence often observed in head-injured children. Therefore, the proposed study would use the children’s version of the “Reading the Mind in the Eyes” test (Baron-Cohen, Wheelwright, Scahill, Spong & Lawson, 2001) to examine potential differences in ability to decode facial expressions and infer mental states, between children who have had head injuries and a non-head injured control group.

It would hence appear that there is potentially something to be gained by investigating theory of mind and social competence in the head-injured paediatric population. Naturalistic behavioural observations and behaviour ratings scales are proposed as the two methods of assessment that should be considered “first-line” choices for assessing the social skills of children and adolescents (Merrell 2001). However, in comparison to direct behavioural observations, behaviour ratings scales are less expensive in terms of the professional time involved and the amount of training required for use. Furthermore, behaviour rating scales provide data on low-frequency behaviours that may not be uncovered by a discrete period of direct observation, and utilise the observations and judgements of individual’s who are highly familiar with the young person’s behaviour – typically teachers (Merrell 2001). Although

teachers are able to observe children in the structured environment of the classroom as well as at play, it is perhaps important to take into account the subjective perception of the children themselves as perception of social functioning may be critical in predicting outcomes following head injury (Warschawsky et al 2003). Furthermore, it is widely accepted that multi-informant assessment is more reliable and valid than relying on a single source of information (Bell-Dolan & Allan 1998). The Matson Evaluation of Social Skills with Youngsters (MESSY; Matson et al 1983) is one such measure that benefits from a multi-informant approach and hence can be used by teachers and children alike. Therefore, the current study proposes to use this measure to assess the social skills of children with head injuries as compared to a non-head injured control group.

Aims & Hypotheses:

The aim of this study is to investigate whether moderately to severely head-injured children are less able to recognise emotion in others and have poorer social skills as rated by teachers and parents. Furthermore, this study also aims to investigate whether there is an association between emotion recognition and social competence amongst the paediatric head injured population. The study will be carried out on children between the ages of 6 and 13 years old, who presented at the Royal Hospital for Sick Children in Glasgow following a head injury. Using a between-groups design, it is hypothesised that:

- Children with moderate to severe head injuries will be less able to recognise emotion in others, hence, will perform relatively more poorly on the children's version of the "Reading the Mind in the Eyes" test, than non-head injured controls.
- Children with moderate to severe head injuries will be less socially competent and hence will perform relatively more poorly on the Matson Evaluation of Social Skills with Youngsters (MESSY; Matson, Rotatori & Helsel 1983) than non-head injured controls.
- There will be a correlation between ability to recognise emotion in others and social competence for the experimental head-injured population.

Plan of Investigation:

Participants:

Experimental Group

The sample will consist of children from 6 to 13 years old who attended the Royal Hospital for Sick Children in Glasgow following Moderate or Severe Head Injury, as classified by the Glasgow Coma Scale. The age range has been defined in this way because over the age of 13 years individuals with head injuries attend their local hospital, and hence by limiting the sample to under 13 year olds a discrete population is potentially accessible. It is also proposed that participants should be at least three months post-injury to be included in this study, as this is the time frame within which post-concussive symptoms are thought to resolve in most cases (Anderson et al 2001).

The minimum criteria for inclusion in the experimental group will include:

- Experience of loss of consciousness following the traumatic head injury.
- Admission to hospital following the traumatic head injury.
- Post Traumatic Amnesia of at least one hour following the traumatic head injury.
- Primary diagnosis of moderate or severe traumatic head injury.

Hence, for inclusion in the experimental group, participants should have all, or a combination of, the above criteria.

Head injury classification will be as follows (Anderson et al 2001):

1. Moderate TBI:

- Loss of consciousness (LoC) exceeding 20 minutes
- Glasgow Coma Scale Score on admission of between 9 and 12.
- Post-traumatic amnesia (PTA) of at least one hour and at most 1 day

2. Severe TBI

- Loss of consciousness (LoC) exceeding 1 hour
- Glasgow Coma Scale Score on admission of 8 or less
- Post-traumatic amnesia (PTA) of more than 1 day.

Control Group

The proposed control group will consist of normally developing children aged between 6 and 13 years of age, who attend mainstream Primary and Secondary schools within the Greater Glasgow & Clyde area. The overall sample will therefore consist of approximately 20 children with moderate to severe head injury, and approximately 20 non-head injured controls.

Participants will be excluded on the grounds of Learning Disability, developmental disorders, psychiatric disorders, or neurological disorders. Participants will be matched on age, sex and their score on the British Picture Vocabulary Scale II (BPVS II Dunn, Dunn, Whetton & Burley 1997).

Recruitment:

It is proposed that the head injured sample will be identified via a database detailing all admissions to the Royal Hospital for Sick Children in Glasgow. Dr Liam Dorris, Consultant Paediatric Neuropsychologist at the Royal Hospital for Sick Children, will access this database which is kept for the purposes of audit, and identify potential participants to make up the experimental group. Dr Dorris will then send the parents or guardians of all potential experimental participants an information pack outlining the aims of the study.

The control group will be identified thus: the principle researcher will firstly write to the Director of Education for Greater Glasgow to request permission to contact the Head Teachers of schools within the area. Once permission is granted, the principle researcher will write to Head Teachers requesting their permission to approach members of staff. Individual members of staff will initially be approached to request that they distribute information packs about the proposed study to the student body, for the perusal of parents and guardians. It is proposed that the principle researcher would briefly visit schools to outline the purposes of the present study to members of teaching staff and to give them the opportunity to ask questions. Information packs will then be left, in sealed envelopes, for willing members of staff to distribute to the student body.

Hence, both the experimental group and the control group will receive information packs, which will include a letter of invitation. This letter of invitation will introduce the principle researcher (Ailish Flatley) as a future point of contact for potential participants, and will be signed by Dr Dorris (Consultant Paediatric Neuropsychologist). Along with this letter information packs will include: a copy of the Parent Information Sheet (either for the head-injured or control group), a copy of the Child Information Sheet (either for the head-injured or the control group), and the relevant Parent/Guardian Consent Form (either for the head-injured or control group). As the proposed sample consists of children aged from 6 to 13 years, it is acknowledged that there will be variations in reading ability. Hence parents will be encouraged to read through the Children's Information Sheet with their child to ensure their

understanding and willingness to take part in the proposed study. After reading through the information packs, parents and guardians are invited to complete and sign the parent/guardian consent form, indicating whether they wish to take part in the research. This consent form will then be returned to the principle researcher (Ailish Flatley) in the stamped addressed envelope provided.

If they have agreed to take part, parents and guardians of head injured children will have signed a consent form that allows the principle researcher permission to access the child's medical notes regarding their head injury. Only after this consent has been given will the principle researcher proceed to access medical records to check whether the potential participants meet any of the study's exclusion criteria. If this turns out to be the case, a standard letter will be sent to their parents or guardians, thanking them for their interest in the study, but stating that as the child meets some of the study's exclusion criteria they cannot take part in the research. If the potential head-injured participants do not meet any of the exclusion criteria, they will be contacted by the principle researcher and an appointment will be arranged for the child to meet the principle researcher and take part in the research. This meeting will take place at the Fraser of Allander Neurosciences Unit at Yorkhill Hospital. The child's teacher will also be contacted and informed that their pupil is taking part in the research, however they will not be informed as to which of the two groups of participants (head injured or non-head injured) their pupil belongs. The teacher will be given an information pack and invited to contribute to the research.

The parents and guardians of non-head injured children will be asked to indicate whether their child meets any of the study's exclusion criteria by filling in a form on which the study's exclusion criteria are listed, and returning it to the principle researcher. If any of the non-head injured children meet any of the study's exclusion criteria, a standard letter will be sent to their parents or guardians, thanking them for their interest in the study, but stating that as the child meets some of the study's exclusion criteria they cannot take part in the research. If however, the child does not fit any of the exclusion criteria and, along with their parents or guardians, have indicated a willingness to take part, the principle researcher will contact the child's teacher to let them know that their pupil is taking part in the study. Teachers will not be told which group of participants (head injured or non-head injured) their pupil is in. The principle researcher will then arrange a convenient time to meet up with the child in school. As with the teachers of the head-injured group, individual teachers of children in the control group will be

sent an information pack outlining the aims and objectives of the current study and will be invited to participate in the research themselves.

Measures:

Measures administered will include:

- The children's version of the Reading the Mind in the Eyes test (Baron-Cohen, Wheelwright, Scahill, Spong & Lawson 2001) – a theory of mind test in which participants are shown 28 photographs of the eye region of a human face and are asked to select from a list the word that best describes what the person in the picture is thinking or feeling. It is proposed that this test will be computerised to allow for analysis of response latency as well as response accuracy. Normally developing children are able to pass this test at approximately 6 years of age.
- The Matson Evaluation of Social Skills with Youngsters (MESSY; Matson et al 1983) – a 64-item rating scale to be completed by teachers and a 62-item self-rating scale to be completed by child participants, which together provide standardised assessment information regarding the frequency of a child's appropriate and inappropriate social behaviours. Respondents rate items on a five point Likert scale. Items refer to discrete observable behaviours rather than global personality traits and the measure is normed for use with children between 4 and 18 years of age. The MESSY (Matson et al 1983) has adequate test-retest and internal reliability as well as concurrent validity and is one of the most thoroughly researched child social skills ratings scales in the literature. Also, it has been used to assess a wide variety of children and hence appears suitable for use with the paediatric head injured population.
- The British Picture Vocabulary Scale Version 2 (BPVS II, Dunn, Dunn, Whetton & Burley 1997) – which will serve as a measure of receptive language skills and hence, verbal intellectual competence. This is important as the Theory of Mind test contains a verbal component

Design & Procedures:

The study will use a matched control between-group design, consisting of a moderate and severe head injury group and a group of matched non-head injured controls. Participants will

be matched as closely as possible using BPVS II scores, current age and sex. The independent variable will be the groups themselves (either head injured or controls) and the dependent variables will be the scores obtained by participants on the Matson Evaluation of Social Skills with Youngsters test (MESSY; Matson et al 1983), and the children's version of the "Reading the Mind in the Eyes" test (Baron-Cohen, et al 2001).

Once a signed consent form has been received by the principle researcher indicating that the child is willing to take part, an appointment will be arranged for the principle researcher to meet the child either at the Fraser of Allander Neurosciences Unit at Yorkhill Hospital or within the child's school. On meeting the child participants, the principle researcher will check that the child is willing to take part in the research and understands what they will be required to do. The principle researcher will then ask the participants to complete the self-report rating scale of the Matson Evaluation of Social Skills with Youngsters (MESSY; Matson et al 1983). To ensure their understanding, each child will be given brief instructions on completion of the ratings scale, and will have the opportunity to ask questions. Following completion of this measure, the BPVS II (Dunn et al 1997) and the children's version of the "Reading the Mind in the Eyes" Test will be administered to each child (Baron-Cohen et al 2001). The time required for individual subject participation will be approximately 1 hour.

Provided that the child participant and their parents/guardians have given their consent, the teachers of the children participating in the study will be sent an information sheet and consent form which will invite them to participate in the proposed research study. The teachers will not be told whether their pupils are in the head injured or non-head injured participant groups. Only after a signed consent form has been received by the principle researcher will teachers receive a copy of the Teacher Ratings form of the Matson Evaluation of Social Skills with Youngsters (Matson et al 1983), along with a covering letter giving them brief instructions on completion of the measure. Teachers will also be asked to provide brief details about how long they have been fully qualified as a teacher, and how long they have known the child in question. This information will be sought so that the principle researcher can briefly describe the characteristics of the group of teachers who took part in the study. A stamped addressed envelope will be provided for the return of this information and the completed ratings scale. The principle researcher will provide each of the teachers involved in the study with her telephone number and email address so that they can get in contact with her if they have any questions about what they are being asked to do.

It is important to note that before any Head Teachers or individual class teachers are contacted for the purposes of this study, the principle researcher will have sent a letter to the Director of Education for Greater Glasgow outlining the present study's hypotheses and objectives and asking for permission to proceed with recruitment of the control group and individual teacher participants. Only after authorisation is granted by the Director of Education, will Head Teachers of schools within the Greater Glasgow & Clyde area be written to, requesting consent to contact individual class teachers. If such consent is gained individual class teachers will initially be invited to distribute information packs to their pupils, for the perusal of their parents/guardians. Once participants and their parents/guardians have read through their information sheets and have consented to becoming involved, each participating child's class teacher will be approached and invited to contribute to the data collected in this research study.

Settings & Equipment:

Data collection will take place either within the Fraser of Allander Neuroscience Unit at the Royal Hospital for Sick Children in Glasgow, or within the Primary or Secondary school attended by the child participants.

Power Calculation:

Power calculations, using the UCLA website, were based on related studies of emotion recognition and theory of mind in children following head injury: Havet-Thomassin et al (2006) compared performance on the "Reading the Mind in the Eyes" test for 17 individuals with severe head injury ($x = 20.6$, $SD = 4$) and 17 normal controls ($x = 27.6$, $SD = 2.7$). Power calculations for the present study therefore indicated that a minimum of 6 head injured participants and 6 controls would be required for a power of 0.8 and an alpha of 0.05.

Furthermore, Warschausky et al (2003) conducted a study comparing social problem solving in children with a history of traumatic brain injury and children with congenital brain abnormalities. Performance of the acquired brain injury group ($x = 20.27$, $SD = 5.64$) and the congenital brain abnormalities group ($x = 16.63$, $SD = 4.97$) were compared on the Social Problem Solving Measure. Power calculations based on this particular study suggest that a minimum of 29 head injured participants and 25 controls would be required for a power of 0.8 and an alpha of 0.05 if unequal variances were assumed.

Finally, Dorris et al (2004) conducted a study, which investigated theory of mind in children with a sibling with Asperger's syndrome compared to normal controls. The children's version of the "Reading the Mind in the Eyes" test was administered to siblings ($x = 18.26$, $SD = 3.61$) and normal controls ($x = 20.04$, $SD = 4.35$). Power calculations for the present study based on this data suggest that a minimum of 57 head injured participants and 68 matched controls would be necessary for a power of 0.8 and an alpha of 0.05, if unequal variances were assumed.

Hence it would appear that there is much variation the necessary size of groups required to achieve a power of 0.8 and an alpha of 0.05 in the present study. Taking into account the parameters outlined above, and the relative heterogeneity of the population being examined in the present study, it would seem viable to suggest that a minimum of 20 head injured participants and 20 matched non-head injured controls would be necessary for the present study to achieve a power of 0.8 and an alpha of 0.05.

Data Analysis:

Data will be analysed using SPSS statistical software. In order to investigate whether the predicted group differences exist between the head-injured group and the non-head injured control group, a series of matched between-samples t-tests will be carried out. In order to investigate whether the hypothesised positive correlation exists between the ability to recognise emotions and social skills within the head-injured group, a correlational design will be used.

Practical Applications:

The proposed study has practical implications, as identifying impairments in recognising emotion and social skills in children with moderate and severe head injury will promote better understanding of factors that contribute to the long-term adjustment of this group. Furthermore, it is important that professionals working with this population are aware of potential deficits in psychosocial skills in order to guide appropriate assessment and intervention.

Timescale:

It is intended that ethical approval will have been gained by January 2007. Data collection is planned to begin in February 2007 and continue for a maximum of 4 months. The project completion date is August 2007.

Ethical Approval:

Ethical approval will be sought from the Primary Care Ethics Committee. If any participants in the proposed study are found to have significant difficulties with emotion recognition and social communication, their families will be offered referral to Dr Liam Dorris (Consultant Paediatric Neuropsychologist) for advice and support in the first instance.

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Addendum: Changes to Protocol

In order to increase participant numbers, the age range for inclusion in this study was widened from 6-13 years to 6-16 years of age and individuals with mild TBI were invited to take part. It was decided that the TBI group would not be matched to control participants on the basis of British Picture Vocabulary Scale score, as there was some concern that TBI may have detrimentally affected verbal intellectual functioning in the experimental group. Hence it would not be appropriate for the TBI group to be matched by BPVS score to control participants who may therefore be lower functioning than the TBI group would have been pre-morbidly.

CHAPTER FOUR: MAJOR RESEARCH PROJECT

Social knowledge and communication in children with Traumatic Brain Injury

Prepared in accordance with the guidelines for Brain Injury (Appendix 4.1)

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Abstract:

Objectives: To examine whether children with mild, moderate and severe traumatic brain injury (TBI) display deficits in social skills and theory of mind (ToM) abilities when compared to non-head injured matched controls.

Research design: The Reading the Mind in the Eyes test and the Matson Evaluation of Social Skills with Youngsters were administered to 15 participants aged 6-16 years with TBI and 15 age and gender matched controls. Teachers of the participants were also invited to rate their pupils' social skills.

Main outcome and results: Children with TBI (primarily mild severity) performed significantly more poorly on the ToM measure than their non-head injured peers. No significant group differences were found between the two groups in terms of self-ratings on the Matson social skills measure.

Conclusion: TBI in childhood has the potential to disrupt theory of mind skills, and this was apparent even in children who sustained mild-moderate TBI. This finding may be important as mild TBIs are often considered innocuous events and the individuals who sustain them are rarely targeted for intervention.

Introduction:

Traumatic brain injury (TBI) is extremely common in childhood. The majority of TBIs sustained by children are mild and persisting sequelae are only thought to occur in a minority of cases. However, children who sustain relatively more serious TBI may experience on-going cognitive and behavioural deficits [1]. While the causes of childhood TBI are diverse, as is the case in the adult population, the majority of injuries are the consequence of falls [2] or road traffic accidents [3]. Research also suggests that children who sustain injuries to the head or elsewhere may be a 'self-selecting' group [4] with pre-injury concentration difficulties or a tendency to display impulsive behaviour [5]. While TBI can result in a range of functional impairments for adults and children alike, post-injury behavioural problems may therefore be at least partially related to premorbid personality factors [6].

Younger individuals show greater neuroplasticity and accelerated recovery following brain injury [7] suggesting that the sequelae of paediatric TBI differs from that of the adult population. However, this plasticity does not necessarily lead to more positive outcomes for those who sustain their injuries relatively early in life: Children experience on-going developmental change, and the effects of TBI in this population may be exacerbated vis-à-vis developmental processes. In the longer term children with TBIs may be less able to acquire developmentally appropriate skills, whereas adults who sustain TBIs may already possess a range of established skills which may recover following initial deficits [7].

Despite emotional, social and behavioural disturbances associated with elevated levels of distress occurring in up to 30% of children with TBI [8], previous research into outcomes following TBI has paid less attention to the effect it may have on social functioning. The importance of considering psychosocial outcomes of head injury is illustrated further by research suggesting that children with TBI experience difficulties maintaining friendships predating their accident, lose status with their peers and have difficulty integrating themselves with their classmates following their injury [4]. Importantly, research also indicates that individuals who have experienced TBI perceive social functioning as a more critical to their quality of life than cognitive or behavioural consequences [9]. Indeed it has been shown that children who have sustained TBI cite losing friendships as their main concern [10].

Recent studies have started to identify the factors underlying poor social functioning following TBI, and there is a growing body of evidence indicating that a crucial aspect of social success

is the ability to accurately infer what others are thinking or feeling. This involves the accurate recognition and interpretation of emotions communicated in social interactions, so-called theory of mind (ToM) abilities [11]. Studies comparing TBI groups to their non-head injured peers point to deficits in ToM following head injury [12, 13, 14], and more recently Snodgrass & Knott [15] specifically linked frontal lobe damage to impaired ToM in a paediatric population. This latter finding is important as TBI often involves damage to the anterior structures of the brain such as the frontal lobes which play a critical role in the neural network supporting social cognition [16]. Frontal systems have a protracted developmental course, which is thought to continue into the second and third decade of life [13]. Hence, TBI sustained in the first two decades of life may not only affect the expression of existing cognitive and social skills but could also compromise future development [13].

Studies with paediatric head injured populations have highlighted other ToM abilities or aspects of ‘social intelligence’ which appear to be detrimentally affected by TBI. For example, a link has been found between TBI and reduced accuracy in recognising facial expressions of emotion, which in turn has been shown to affect social competence [17, 18]. Furthermore, children with TBI show deficits in pragmatic language ability – that is the ability to understand what is *implied* in a conversation as well as what is said [19]. Drawing conclusions about mood or intentions based on facial expression and understanding the implied meanings in conversation both require children to make quick and accurate inferences or assumptions based on the often limited amount of information directly presented to them during the course of social interaction. Deficits in emotion recognition and pragmatic language ability would therefore impact negatively on a child’s ability to process social information accurately and respond appropriately [20].

It is notable that the majority of studies of social functioning following TBI have used participants with relatively severe head injuries despite approximately 15% of individuals who experience mild TBI reporting continued negative consequences up to one year post-injury, including poor social functioning [21]. Moreover, the impact of TBI on social competency may be particularly relevant to individuals with mild TBI as they are often thought to recover with no persistent impairments and therefore may not be identified as requiring specialist input as readily as those with more severe injuries [7].

Following on from these considerations, the present study investigates whether children with TBI differ from matched non-head injured controls in theory of mind ability and social skills. The study also investigates a conceivable link between ability to accurately recognise emotional facial expressions and social competence amongst a paediatric TBI population. It is hypothesised that:

1. Children with TBI will be less able to recognise emotions and accurately interpret facial expressions than non-head injured controls, and will perform more poorly on the children's version of the "Reading the Mind in the Eyes" test [22].
2. Children with TBI will perform less well than non-head injured controls on the Matson Evaluation of Social Skills with Youngsters questionnaire measure (MESSY [23]).
3. Ability on the Reading the Mind in the Eyes test [22] and performance on the Matson Evaluation of Social Skills with Youngsters [23] will be correlated in children with TBI.

Method

Design

Children with TBI were matched with non-injured controls in a between-group design, investigating differences in performance on theory of mind and social skills measures.

Power calculation

Power calculations, using the UCLA website, were based on several related studies of emotion recognition and theory of mind skills in children and adults with TBI [e.g. 9, 12, 24]. Based on these calculations, it was deemed that approximately 20 participants with TBI and 20 matched non-head injured controls would be necessary for the present study to achieve a power of 0.8 and an alpha of 0.05.

Participants:

The traumatic brain injury (TBI) group consisted of 15 children (6 female, 9 male) aged between 6 and 16 years (mean age 10.4 years, standard deviation = 3.10 years). All participants in the TBI group were recruited from a regional specialist outpatient's service for children with brain injuries in the West of Scotland. The minimum criteria for inclusion in the TBI group was admission to hospital with a primary diagnosis of mild, moderate or severe TBI that was sustained at least three months prior to testing. Thirteen children in the experimental group sustained a mild TBI, one a moderate TBI and one a severe TBI.

TBI classification was as follows [3]:

Mild TBI:

- Loss of consciousness (LoC) transient, if at all
- Glasgow Coma Scale Score on admission of 13-15
- Post Traumatic amnesia (PTA) of up to one hour

Moderate TBI:

- Loss of consciousness (LoC) exceeding 20 minutes
- Glasgow Coma Scale Score on admission of 9-12.
- Post-traumatic amnesia (PTA) of at least one hour and at most 1 day

Severe TBI

- Loss of consciousness (LoC) exceeding 30 minutes
- Glasgow Coma Scale Score on admission of 8 or less
- Post-traumatic amnesia (PTA) of more than 1 day.

The control group consisted of 15 normally developing children (6 females 9 males) aged between 6 and 15 years (mean age 10.3 years, standard deviation = 2.4 years) attending a mainstream primary or secondary school in the Greater Glasgow area. Controls were closely matched to the TBI group by age and sex. Participants in both the groups were excluded if they had a premorbid learning disability, developmental disorder, psychiatric disorder, pre-existing neurological disorder or previous TBI. The British Picture Vocabulary Scale Version 2 [25] was administered to all participants as a control measure, and to provide an estimate of verbal intellectual ability. Examination of the data showed that although the BPVS scores of the TBI group were normally distributed, the scores of the control group on the BPVS measure were negatively skewed. The non-parametric Wilcoxon test gave a z-score of -1.48, $p=0.14$ (two-tailed), indicating that there were no significant differences between the two groups. To investigate the socio-economic status of the two groups, each participant was asked to provide their post-code. From this the deprivation category of the area in which each participant lived was calculated using the Carstairs Deprivation Category scores [26]. A Wilcoxon test gave a z-score of -1.03, $p=0.302$ (two-tailed). This showed that the two groups did not differ significantly in terms of SES (see Table 1).

Table 1: Composition of the sample

Group	<i>n</i>	Mean Age (SD)	Median Dep Cat*	Mean BPVS score (SD)
TBI	15 (6 female)	10.4 years (3.10)	4	97.27 (15.92)
Control	15 (6 female)	10.3 years (2.4)	3	101.53 (26.77)

**Dep Cats rated 1-7. 1 = most deprived area 7 = most affluent area*

Procedure

Ethical approval to proceed with the present study was granted by the Primary Care Ethics Committee in February 2007 (see Appendix 4.2). Approval to proceed was also gained from the Primary Care Division Research & Development Directorate and the Research & Development Department of the Royal Hospital for Sick Children in Glasgow (Appendices 4.3 & 4.4).

Participants in the TBI group were identified via a database of admissions to the regional specialist outpatient service for children with brain injuries in the West of Scotland. A Consultant Clinical Neuropsychologist within this service contacted all potential participants by post and invited them to take part in the present study (see Appendix 4.5). Control participants were accessed by approaching Head Teachers and members of teaching staff in local primary and secondary schools and requesting that they distributed information packs about the study to their student body, for the perusal of parents and guardians (Appendix 4.6). Permission to approach teaching staff and pupils was granted by the Director of Education for Greater Glasgow in January 2007 (Appendix 4.7). Of the 200 individuals invited to take part in the study, 30 opted in, giving a response rate of 15%. All participants were assessed using the following measures in the order described below. Experimental participants were tested individually in the hospital outpatient clinic, and control participants were tested individually within the school setting. Participation in the study took each child approximately 30 minutes. Each participant's parent/guardian was asked to give consent for their child's teacher to be contacted to gather further data on social functioning. If consent was given, the teacher in question was approached and invited to take part in the study (Appendix 4.8).

Measures:

The following measures were administered:

- The children's version of the Reading the Mind in the Eyes test [22] was administered to assess theory of mind skills. Participants are shown 28 photographs

of the eye region of a human face and asked to select from a list the word that best described what the person in the picture might be thinking or feeling. This measure is designed for children of 6 years and above and has been shown to be reliable and valid [22].

- The Matson Evaluation of Social Skills with Youngsters (MESSY [23]), a 62-item self-rating questionnaire recording the frequency of appropriate and inappropriate social behaviours was completed by the child participants. Following the period of testing a 64-item rating scale was sent to participants' teachers if parents and teachers had consented to this. All respondents were asked to rate items referring to discrete observable behaviours rather than global personality traits, on a five point Likert scale. The MESSY is normed for use with individuals between 4 and 28 years of age, has adequate test-retest and internal reliability as well as concurrent validity [27, 28]

Data was analysed using SPSS statistical software. Kolmogorov-Smirnov tests were carried out on the data generated by the Reading the Mind in the Eyes test and the MESSY test, and normal distributions were confirmed ($p>0.05$). In order to investigate whether the predicted group differences exist between the TBI group and the controls, a series of planned comparisons using matched pairs *t*-tests were carried out. In order to investigate whether the hypothesised positive correlation exists between the ability to recognise emotions and social skills within the head-injured group, a correlational design was used.

Results

The mean scores and standard deviations achieved by the two groups on the measures administered in the current study are given in Table 2. Higher scores on the MESSY indicate poorer social skills whereas lower scores on the Eyes test indicate poorer ability.

Table 2: Mean scores and standard deviations of participant responses to main measures

Tests	TBI	Control
Eyes Test	16.87 (3.89)	20.20 (4.44)
MESSY	119.13 (21.12)	111.40 (16.97)

The Reading the Mind in the Eyes test.

The TBI group scored more poorly on the ToM test than controls (matched pairs *t*-test; $t(14)=3.10, p<0.05$).

To investigate this finding further, a chi-square analysis was carried out on the number of correct answers for each category of emotional stimuli (positive, negative or neutral). Irrespective of group membership, significant differences were found between the observed and expected frequencies of correct response to positive, negative and neutral stimuli, $\chi^2=133.64$, $df=2$, $p=0.0001$. This suggests that more correct answers were given to negative emotional stimuli than would be expected to occur by chance (and fewer correct answers to positive stimuli), see Table 3.

Table 3: Observed & expected frequencies of correct responses to stimuli irrespective of group

Frequencies	Positive Stimuli	Negative Stimuli	Neutral Stimuli
Observed	95	310	152
Expected	185.7	185.7	185.7

It appears that, irrespective of group, children included in the study were more accurate in identifying negative stimuli. It would also appear that participants in this study had difficulty correctly identifying the positive emotional stimuli presented in the Reading the Mind in the Eyes test. Furthermore, a trend in the data also suggested that children with TBI made more errors of ‘opposite polarity’ than controls (eg identifying happy as sad [18]; see Appendix 4.9). A further 3x2 chi square indicated that there was no significant relationship between group membership (TBI or control) and correct answers for emotionally valenced stimuli ($\chi^2=3.01$, $df=2$, $p=0.22$).

As only one participant had sustained a severe TBI, it is acknowledged that the experimental sample was not representative of all categories of TBI. In order to consider results for the 14 mild-moderate TBIs the single severe case was excluded. A matched pairs t-test indicated little change; the mild-moderate TBI group still performed significantly more poorly on the ToM test, than controls ($t(13)=2.84$, $p<0.05$). The effect size before the participant with severe TBI was removed was $d=0.80$, and similar after their data had been excluded from analysis ($d=0.77$). The significant differences between correct answers to positive, negative and neutral stimuli persisted irrespective of group (Chi Square; $\chi^2 = 127.72$, $df=2$, $p>0.0001$) and no significant relationship was found between group membership (mild-moderate TBI or control) and correct answers for emotionally valenced stimuli.

The Matson Evaluation of Social Skills with Youngsters – self rating version

A matched pairs *t*-test on the self-rating version of the MESSY indicated no significant differences between groups on overall MESSY scores, ($t(14)=1.28, p=0.22$). Matched pairs *t*-tests revealed no statistically significant differences between groups for scores on any of the 6 MESSY subscales ($p>0.05$). Again, data from the participant who had sustained a severe TBI and their matched control were excluded from the analyses. However, this did not appear to make any difference to the outcomes for this measure ($t(13)=1.38, p=0.192$).

Theory of Mind & social competence

It was hypothesised that theory of mind and social skills would be positively correlated. However, no such relationship was found ($n=30, r= -0.03, p=0.43$). This was still the case when the data from the severely injured participant and their matched control was removed ($n=30, r= 0.10, p=0.61$).

The Matson Evaluation of Social Skills with Youngsters – teacher rating version

No significant differences between groups were found on the teacher-rated MESSY, or on the Appropriate and Inappropriate subscales, using matched pairs *t*-tests, $p>0.05$ (see Appendix 4.10). Only 20% of the teachers of participants in the TBI group (i.e. 3/15) opted to contribute data to this study and hence the data were considered too sparse to be included in this analysis.

Discussion

This study compares the performance of children with TBI to that of an age and gender matched control group on measures of theory of mind and social skills. It was hypothesised that children with TBI would be less accurate in identifying facial expressions of emotions, and less socially competent than their non-injured peers.

The results support the hypothesis that children with TBI have poorer theory of mind than their non-head injured peers. This finding lends further support to previous work [15, 29, 30] indicating that TBI in childhood can affect aspects of social intelligence which may adversely impact on social skills. In the present study children with TBI made significantly more errors overall when asked to correctly identify what a person might be thinking or feeling. For both groups, errors were less common when a negative emotion was presented. This may be because negative expressions in the Reading the Mind in the Eyes test were more familiar and distinguishable to the participants, and therefore easier to detect. Similarly, both the TBI and

control groups were less accurate in identifying positive facial expressions than would have been expected to occur by chance. This finding is consistent with other studies that indicate that people have evolved to be biologically ‘hard-wired’ to recognise threat [31]. Moreover, visual search experiments suggest that negative facial expressions are more attention-grabbing than neutral or positive facial expressions [32]. As well as being more accurate at detecting negative stimuli, a trend suggested that the TBI group may have been more likely than controls to incorrectly interpret positive stimuli as being negative (see Appendix 4.9). This error of ‘opposite polarity’ in detecting facial expression is relatively common following TBI [18, 30] and it would be interesting for future studies using larger sample sizes to investigate this trend further. In general, children and adults find it harder to disengage their attention from negative or threat-related stimuli [32], and it has been reported that, following TBI, children have difficulty regulating their cognitions, emotions and behavioural responses [15, 33]. Given these findings, it is conceivable that the TBI group in the present study were comparatively less able to disengage from the more attention-grabbing negative stimuli and regulate their cognitive and behavioural responses to the same degree as the control group. The TBI group may therefore have preferentially selected words more reflective of negative emotions, regardless of accuracy. It may be beneficial for future research to explore this issue further.

Also, the Reading the Mind in the Eyes test investigated individuals ability to decipher the emotions conveyed by the relatively limited eye region of a face, and therefore measured a specific aspect of emotion recognition and social intelligence. In real-life social situations individuals are presented with many more clues about the thoughts and feelings of others, for example in the posture or the tone and pitch of voice used by those with whom they interact. Therefore it may also be useful for research to take a more holistic approach to the evaluation of theory of mind following head injury in the future.

The majority of studies that find theory of mind deficits following TBI have tested children whose head injuries have been categorised as severe. However, 13 out of the 15 participants in the present study’s experimental group were categorised as having a mild TBI. With research suggesting that 90% of head injuries sustained by individuals in the present study’s age range are indeed categorised as mild [34], the constitution of the present TBI sample may therefore provide a fair reflection of the wider paediatric head injured population under investigation. Nonetheless, the experimental group is likely to have been more representative

of mild to moderate TBI, despite the results remaining very similar when statistical analyses were re-run to include only participants with mild and moderate TBI.

While a recent study [35] indicates that ToM impairments exist in adults who have sustained mild TBI, the present study is the first to provide evidence that ToM deficit(s) may exist following mild TBI in childhood. These findings are important. To date individuals who sustained mild head injuries would not necessarily have been targeted for interventions, or been the focus of much research since mild head injury may be regarded as not leaving persisting negative impacts, [7] however the present findings provide some evidence for the notion that even mild TBI can impact adversely on individuals' social competency. Moreover, the performance of the TBI group on the ToM task used in the present study is likely to underestimate the extent of the impairment in ToM caused by head injury. This is because the Reading the Mind in the Eyes test was administered in a quiet room away from distractions and did not require an instantaneous response from participants. In contrast, real life social interactions which require ToM abilities often take place in busy and noisy environments and demand quick decisions and rapid responses. This may be problematic for individuals with even mild forms of TBI that may have impacted on mental processing speed, or resulted in deficits in executive functioning [35]. In terms of clinical practice, the findings of the present study therefore suggest that attention should be paid to social functioning following all severities of TBI, and it should not necessarily be assumed that mild TBI is a largely innocuous event. Although further research utilising larger samples is needed to replicate the results of the present study and those presented by Milders and colleagues [35] it appears plausible that programmes designed to improve ToM ability, currently being used with individuals with autism [36], could be adapted to become effective interventions for children with mild to moderate TBI.

The second hypothesis that children with TBI would be less socially skilled than their non-injured peers, reflected by scores on the self-rated and teacher-rated versions of the MESSY, was not supported. Despite the limited statistical power of the present study this finding was somewhat surprising given that previous research has provided relatively strong evidence for social skills deficits following TBI (e.g. 18, 30, 33, 37). Furthermore the TBI group in the present study was found to be significantly less skilled in terms of accurately predicting or inferring what others may be thinking or feeling – skills that are of vital importance to successful social interaction [12, 15, 22]. Aside from poor theory of mind abilities, social

skills deficits may exist following head injury for a variety of reasons. Parental anxieties following their children's head injury may mean that children with TBI develop in a relatively more protected social environment than their non-injured peers, and hence may not need to refine their social skills to the same degree. Furthermore, children with TBI may not be given the same degree of negative feedback on inappropriate behaviours as non-injured children [38] since peers, parents and teachers alike may acknowledge the traumatic and anxiety-provoking nature of the head-injured child's experience [39, 40]. On the other hand, it may be the case that children who experience TBI are more poorly supervised by their parents and may be more inattentive and impulsive than their non-injured peers, and it may be these factors that detrimentally impact on their social skills [5]. The fact, therefore, that the current study did not find any significant differences between the two groups in terms of social skills may be accounted for by the small sample size used.

A further reason for the lack of significant differences between the TBI and control groups may be related to the measure that was used to assess social skills. Despite being well-normed and thoroughly researched, the MESSY relies on subjective report as a means of gathering data on social skills. Inaccurate reporting may have been particularly problematic amongst participants in the experimental group, as it has been suggested that children with TBI are both insightful and concerned about their difficulties with social interactions and maintaining friendships [10]. The TBI group may therefore have had more motivation than controls to respond inaccurately to sensitive questions such as 'I know how to make friends' or 'I feel lonely'. Possible inaccuracy of reporting may also have contributed to the finding that theory of mind ability and social skills were not correlated in the present study.

It would therefore have been useful to compare the rating that the children from both groups gave themselves with the ratings of their teachers. This may have given some indication as to whether the children were indeed being inaccurate in their responses. However, it was not possible to do this as very few teachers opted to contribute data to the study. It might be better therefore to use the Parent-rated version of the MESSY in future research of this nature. However, even if this version had been used, the data gathered may still have been subject to social desirability response bias [41] and inaccurate reporting as parents may have minimised or maximised their children's perceived social shortcomings. Future studies could therefore benefit from utilising social skills measures which do not rely on self-reports, for example direct (or video) observation of peer interactions [42] measures of social competency like the

Social Problem Solving Measure [43], which require children to generate responses to ‘real life’ social dilemmas, or measures which utilise peer ratings of social behaviour such as the Friendship Quality Questionnaire [44].

The present study highlights the effect of TBI on theory of mind skills in mild-moderate, TBI, and is one of the first of its kind to do so with a paediatric population. However, a number of limitations need to be borne in mind when considering the findings. First, while obtaining a statistically significant effect for theory of mind ability with a small sample attests to the robustness of this finding, the impact of relatively small sample size on the study as a whole needs to be considered, especially in relation to the non-significant findings. Second, there was an uneven mix of head injury severities in the TBI group. Although this study extends previous work predominantly conducted with more severely brain injured participants by including a large number of participants with mild TBI, future research would benefit from utilising larger samples that may enable researchers to tease out conceivable differences as a function of injury severity. Furthermore, participants in the present study were self-selected, and this may have had an impact on findings. As indicated earlier only 15% of participants approached opted to take part in the study and therefore the possibility exists that those individuals who opted to take part might have differed, for example, in terms of motivation, from those who did not wish to be involved. Future studies of this nature are therefore likely to benefit from accessing participants via consecutive admissions or referrals to a clinic.

Another limitation was that the control group in the present study was made up of normally developing controls recruited from mainstream primary and secondary schools. As detailed earlier, there is evidence to suggest that children who sustain injuries to their head or other parts of their bodies may have premorbid characteristics such as inattention and impulsivity [5] which they do not share with children who have never sustained such injuries. Future work in this area may therefore benefit from using orthopaedic control participants to minimise the likelihood of qualitative differences existing between the two groups before measures are administered.

With regards to directions for future research, it would be useful to investigate how age at injury affects ToM skills. Turkstra et al [13] found that individuals who were injured relatively later in childhood or in early adolescence, after the basic foundations for ToM skills had been developed, were able to gain more knowledge of social skills after their TBI than

individuals who had been injured relatively more early in life. Furthermore, it would be interesting to investigate whether the impairments in ToM after TBI become more severe over time; as changes in interactions with the social environment may lead to fewer opportunities to develop and refine remaining ToM skills [35].

Since the present study was not designed to allow for consideration of neural mechanisms underpinning ToM function, future studies could take into account the specific areas of the brain damaged in their experimental groups. Research suggests that ToM may be primarily a function of the frontal lobe [45], however the neurological impact of brain injury is often diffuse and hence the literature would benefit from carefully designed studies taking lesion localisation into account when investigating the consequences of TBI on the developing brain. Furthermore the present study measured theory of mind only by ability to infer and deduce the feelings or mental states of others from facial expression. However, as mentioned earlier, studies of paediatric head injury have highlighted several areas of functioning which could contribute to ‘social intelligence’ including pragmatic language ability and executive functions such as planning, organising and response inhibition. Given that the present study has found evidence to suggest that the ability to correctly infer mental states can be adversely affected by even mild TBI, it seems important that more research considers whether pragmatic language ability and executive functioning are also affected by what has traditionally been considered to be a largely innocuous event.

Conclusion

To conclude, although previous research has acknowledged the potential for severe TBI to have adverse effects on ‘social intelligence’, the results of the present study suggest that mild and moderate TBI sustained in childhood may disrupt theory of mind skills, as measured by the Reading the Mind in the Eyes test [22]. The clinical and theoretical importance of these findings could be far-reaching. The present study therefore needs to be replicated, incorporating larger sample sizes and differing severities of TBI. The hypothesised link between ToM skills and social competency may also benefit from further investigation using more naturalistic or observational measures than were utilised in the present study. It is acknowledged that this area of research is still evolving, however the present study indicates that more research into the effects of all severities of TBI on the developing brain is warranted. A fuller understanding of psychosocial outcomes following traumatic brain injury in childhood could benefit clinical practice with young people with mild/moderate TBIs.

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CHAPTER FIVE: SINGLE N RESEARCH PROPOSAL ABSTRACT

An investigation into the use of Attention Training Techniques (ATT) for the treatment of anxiety associated with diarrhoea-predominant irritable bowel syndrome: a single case experimental design.

Written in accordance with the guidelines for the Journal of Consulting & Clinical Psychology (Appendix 5.1)

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

Abstract

Background: Irritable Bowel Syndrome (IBS) affects up to a quarter of the population and accounts for over a third of referrals to gastroenterology clinics. The primary symptoms are typically pain or discomfort in the lower abdomen, bloating and altered bowel function: diarrhoea, constipation or both. IBS is not a life-threatening disorder, nor is it associated with future development of other disorders such as gastrointestinal cancers. However, sufferers report that it is an extremely debilitating condition, which has a significant impact on quality of life. Although there is no consensus of opinion on what causes IBS, it is understood that the condition can be exacerbated by anxiety.

Research question: To investigate the effectiveness of Attention Training Techniques in reducing anxiety related to diarrhoea predominant IBS.

Method: The proposed participant is a 36-year old woman who was referred to Clinical Psychology services with anxiety and hypervigilance to sensations in her bowel, associated with IBS. It is hypothesised that decreasing the participant's self-focused attention through Attention Training Technique would decrease her hypervigilance to sensations in her bowel and lead to a reduction in the frequency with which she felt that she was going to have diarrhoea. This would potentially decrease her overall anxiety and lead to a relative stabilising of the autonomic nervous system's input to her gastrointestinal system, leading to a reduction in the frequency with which she actually experiences diarrhoea. Finally it is hypothesised that reducing the participant's safety behaviours would lead to a reduction in her belief that she is likely to experience uncontrollable diarrhoea and soil herself in public. The proposed study would therefore utilise a single subject A-B-C design with follow-up. Phase A would include administering baseline measures to the participant to monitor her mood, quality of life and the frequency with which she experiences, or thinks she is going to experience, diarrhoea. In Phase B the participant would be introduced to, and invited to practice, Attention Training Techniques and Phase C would concentrate on helping the participant to reduce her safety behaviours. It is proposed that follow-up would take place three months after the conclusion of treatment Phase C. The aim of the follow-up session would be to determine whether any of the gains brought about by the treatment phases had persisted over time.

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Appendix 1.1 – Guidelines from Doctorate in Clinical Psychology course handbook.

Small Scale Service Related Research Project

The report should be produced in a form for publication in a service-oriented publication or in-service publication. An alternative is to present in the form of a report to senior management e.g. using presentation notes with bullet points and OHP acetates.

The format presented below is based on BPS Guidelines for Small Scale Research:

- 1.1 Title
- 1.2 An introduction to the problem with reference to the relevant literature (a comprehensive review is not required) and clear statement of specific questions being addressed.
- 1.3 An account of the sample and methods used in the study and of the practical work undertaken
- 1.4 A clear presentation of the results of the study. The emphasis in the Small Scale Research Project is to be placed on the clear presentation of findings rather than the demonstration of statistical expertise.
- 1.5 A discussion of the research findings in the context of the specific problem addressed, together with recommendation for service provision and future research.

Appendix 2.1 Guidelines for contributors to Brain Injury

General Guidelines

This journal covers all aspects of brain injury from basic science, neurological techniques and outcomes to vocational aspects, with studies of rehabilitation and outcome of both patients and their families, It addresses both adult and paediatric issues and it embraces issues such as family and peer relationships, effects of alcohol and drugs, communication problems and management techniques and creating new programmes Brain Injury uses case studies to illustrate different approaches to a subject, and provides a forum for the appraisal of theories which may influence future research. Brain Injury is the official research journal of the International Brain Injury Association.

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- 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.

Appendix 2.1 Guidelines for contributors to Brain Injury (continued)

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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.

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Appendix 2.1 Guidelines for contributors to Brain Injury (continued)

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When experimental animals are used, state the species, strain, number used, and other pertinent descriptive characteristics.

For human subjects or patients, describe their characteristics.

For human participants in a research survey, secure the consent for data and other material - verbatim quotations from interviews, etc. - to be used.

When describing surgical procedures on animals, identify the pre anaesthetic and anaesthetic agents used and state the amount of concentration and the route and frequency of administration for each. The use of paralytic agents such as curare or succinylcholine, is not an acceptable substitute for anaesthetics. For other invasive procedures on animals, report the analgesic or tranquilizing drugs used if none were used, provide justification for such exclusion.

When reporting studies on unanaesthetized animals or on humans, indicate that the procedures followed were in accordance with institutional guidelines.

Specific permission for facial photographs of patients is required. A letter of consent must accompany the photographs of patients in which a possibility of identification exists. It is not sufficient to cover the eyes to mask identity.

Mathematics

Special care should be taken with mathematical scripts, especially subscripts and superscripts and differentiation between the letter 'ell' and the figure one, and the letter 'oh' and the figure zero. If your keyboard does not have the characters you need, it is preferable to use longhand, in which case it is important to differentiate between capital and small letters, K, k and x and other similar groups of letters. Special symbols should be highlighted in the text and explained in the margin. In some cases it is helpful to supply annotated lists of symbols for the guidance of the sub-editor and the typesetter, and/or a 'Nomenclature' section preceding the 'Introduction'.

For simple fractions in the text, the solidus / should be used instead of a horizontal line, care being taken to insert parentheses where necessary to avoid ambiguity, for example, $I/(n-1)$. Exceptions are the proper fractions available as single type on a keyboard.

Full formulae or equations should be displayed, that is, written on a separate line. Horizontal lines are preferable to solidi, for example:

$611 - 5h + q$

$3n + 3yz$

$9U$

Appendix 2.1 Guidelines for contributors to Brain Injury (continued)

But: $a/b + c/d + aid$

$P = (a + b + d$

The solidus is not generally used for units: ms⁻¹ not m/s, but note electrons/s, counts/channel, etc.

Displayed equations referred to in the text should be numbered serially (1, 2, etc.) on the right hand side of the page. Short expressions not referred to by any number will usually be incorporated in the text.

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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. However, note also that Brain Injury does not aspire to be international in the ways that McDonald's restaurants or Hilton Hotels are 'international'; we much prefer papers that, where appropriate, reflect the particularities of each higher education system.

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

1. Brain Injury prefers US to 'American', USA to 'United States', and UK to 'United Kingdom'.
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8. Apostrophes should be used sparingly. Thus, decades should be referred to as follows: 'The 1980s [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.
9. 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 [1989a).
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Appendix 2.1 Guidelines for contributors to Brain Injury (continued)

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References

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Examples are provided as follows:

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

Book chapter: [Kuret JA, Murad F. Adenohypophyseal hormones and related substances. In: Gilman AG, Rall I W, 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: [Mangie ED. A comparative study of the perceptions of illness in New Kingdom Egypt and Mesopotamia of the early first millennium [Akron (OH): University of Akron; 1991. 160 p. Available from: University Microfilms, Ann Arbor MI; AAG9203425.

Appendix 2.1 Guidelines for contributors to Brain Injury (continued)

Journal article on internet; [Loker WM. "Campesinos" and the crisis of modernization in Latin America. Jour of P01 Ecol [online] 1996; 3(1). Available: <http://w> via the INTERNET. Accessed 1996 Aug 11.

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

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Appendix 2.2 – Justification of inclusion of quality criteria

External Validity

These questions were chosen to highlight whether the results of the studies included in this systematic review were generalisable in terms of their experimental participants being representative of the larger head injured population and their control group participants being representative of the larger non-head injured population.

Qus.1. What was the source of recruitment for the experimental group?

This question was chosen because experimental participants who are clinic attenders are likely to be qualitatively different, in terms of severity of injury and outcome, from experimental participants who have been recruited from a non-clinical setting or from the community.

Qu. 2 What was the source of recruitment for the control group?

This question was chosen because a control group recruited from another clinical source is likely to be qualitatively different from a control group recruited from the community. Studies have suggested that control participants recruited from the community may have significantly different characteristics (i.e. level of impulsivity, socioeconomic status) than control participants recruited from clinical settings, and experimental participants [22].

Qus.3 & 4. How were participants in the experimental/control group recruited?

Mass canvassing through, for example, poster advertising may result in self-selected populations who may not be truly representative of their group. Clinical populations drawn from consecutive admissions or referrals to a clinic would be most representative.

Qu.5 Was there any financial or other incentive for participation?

Providing an incentive may result in a response bias, as participants may feel obliged to respond in a way which would conform to the expectations of the researcher.

Internal Validity

These questions were chosen to assess how well each study included in this review ensured that it was able to accurately answer the question it posed, while controlling for potentially confounding factors.

Qu.7 What was the range of severity of injury in the experimental group?

Qu.8 What was the mean time since injury in the experimental group?

Participants within the experimental group will differ in terms of severity of TBI, and mean time since it was sustained. These factors can influence social outcomes, recovery, adjustment and so on (Anderson, Catroppa, Morse, Haritou & Rosenfeld 2000, Jacobsen 1995). Internal validity is ensured by explicitly stating the range of severity of TBI and mean time since injury in the experimental group, hence acknowledging the potential contribution these factors may have to the data obtained.

Qus.9&10 Were participants in the experimental/control group excluded due to previous head injuries?

It is preferable to examine single head injuries in isolation. If members of the experimental group have had previous head injuries outcomes may reflect the cumulative impact of multiple head injuries, not the index injury alone. Also the data collected from the control group would be contaminated by the inclusion of participants with previous injuries similar to those sustained by members of the experimental group.

Qu.11 Were participants with in the experimental or control group excluded due to pre-existing neurological disorder?

Excluding participants with pre-existing neurological disorders from the experimental group ensures that the results gained are due to the effects of head injury alone. Excluding participants with pre-existing neurological disorders from the control group would ensure that the results gained from this group were not contaminated by potentially confounding variables.

Additional Criteria of Relevance

Qu.6 Was a sample size calculation performed?

This question was included as it is important that researchers know the sample size necessary to obtain the desired power to detect a difference in their data if one actually exists. This increases the probability of rejecting the null hypothesis when it is false or accepting the alternative hypothesis when it is true (Cohen 1992).

Qu.12 What measures were used to assess caseness in the experimental TBI group?

Measures used to assess caseness in the experimental group are Glasgow Coma Scale (GCS) score, duration of Loss of Consciousness (LoC) and duration of Post Traumatic Amnesia (PTA). These measures are considered important because they give the most reliable indication of severity and predicted outcome after traumatic brain injury.

Qu.13 Were measures used to assess caseness in the control group adequate?

For this question, a subjective rating of the relative homogeneity of the control group was made based on the descriptions provided. This was included as it was considered important that the control group accurately represents the wider non-head injured or orthopaedic population

Qu.14 Was the main assessment measure previously published or devised by the author?

Measures which have been devised specifically by authors to meet the needs of a particular study are likely to have little data regarding their reliability and validity. This question therefore provides a general indicator of the reliability and validity of the assessment measures used.

Qu.15 From whom was information gathered during assessment?

This question was chosen because gathering information from multiple informants, for example children, parents and teachers, is considered optimum in research with children and adolescents and has proven to be more reliable and accurate than using data from a single source [21].

Appendix 2.3 – Strengths and weaknesses of included studies

Study	Quality Rating	Strengths	Weaknesses
Janusz et al (2002)	High – 82%	<ul style="list-style-type: none"> • Relatively large sample sizes (n=) • Experimental group recruited from clinical setting, consecutive referrals • Control group from clinical setting, consecutive referrals • No incentives give • Mean time of >3mths post-injury • Control group excluded if previous TBI or neuro disorder • Exp group excluded if previous neuro disorder • INS interview good measure • Data gathered from child& parent. 	<ul style="list-style-type: none"> • Experimental participants not excluded for previous TBI • No power calculation • Heterogeneous experimental group
Andrews et al (1998)	High – 80%	<ul style="list-style-type: none"> • Experimental group recruited from clinical setting, consecutive referrals • No incentives given • Mean time of >3mths post-injury • Participants excluded from both groups for previous TBI and/or neuro disorder • Data gathered from child & parent 	<ul style="list-style-type: none"> • Small sample sizes • No power calculations • All data gathered from questionnaires • Controls from non-clinical setting & self-selected • Heterogeneous exp group (mild=8, mod=9, severe=10)

Appendix 2.3: Strengths and weaknesses of included studies (continued)

Study	Quality Rating	Strengths	Weaknesses
Ganesalingam et al (2006)	High – 76%	<ul style="list-style-type: none"> • Experimental group recruited from clinical setting • Large sample sizes (n=65) • Mean time >3 months post-injury • Data collected from child, parent and teacher • Participants excluded from both groups for previous TBI and/or neuro disorder • Data collected directly from children used reliable measures • No incentives given 	<ul style="list-style-type: none"> • No power calculation • Control group from non-clinical setting • Control group self-selected • Lack of info about control group • Experimental group recruited via convenience sample • Experimental and control participants recruited from different countries
Yeates et al (2004)	Mod - 73%	<ul style="list-style-type: none"> • Large sample sizes • Experimental group recruited from clinical setting • Control group recruited from clinical setting • Mean time of >3mths post-injury • Exp & control excluded if previous neuro disorder • Controls excluded if previous TBI • INS interview good measure • Data gathered from child & parent • No incentives given 	<ul style="list-style-type: none"> • All participants self-selected • Experimental participants not excluded for previous TBI • Substantial drop-out rate especially amongst lower SES and orthopaedic control group • No power calculation • Heterogeneous exp group (53 severe, 56 mod)

Appendix 2.3: Strengths and weaknesses of included studies (continued)

Study	Quality Rating	Strengths	Weaknesses
Snodgrass et al (2006)	Mod – 71%	<ul style="list-style-type: none"> • Experimental group recruited from clinical setting • No incentives given • Post-hoc power calculations carried out • Mean time >3 months post-injury • Participants excluded from both groups for previous TBI • Participants excluded from the control group for previous neuro disorder • Reliable and valid measures used. 	<ul style="list-style-type: none"> • Small sample sizes (n=12) • Control group recruited from non-clinical/community setting • Control group self-selected • Experimental group self-selected • Exp group was of mixed severity (severe=9, mod=3) • Experimental participants not excluded for previous neurological disorder • Data gathered from the child alone.
Bohnert et al (1997)	Mod – 62%	<ul style="list-style-type: none"> • Experimental group recruited from clinical setting • No incentives given • Mean time >3 months post-injury • Participants excluded from experimental group for having previous TBI or neuro disorder • Data gathered from child& parent 	<ul style="list-style-type: none"> • Data from control group came from pre-existing data set • Lack of info about control group • Small sample size • No power calculations • Experimental group of mixed severity (severe = 15, not stated = 7) • Not stated whether control participants excluded for previous TBI or neuro disorder • Data gathered primarily by questionnaire measure

Appendix 2.3: Strengths and weaknesses of included studies (continued)

Study	Quality Rating	Strengths	Weaknesses
Lewis et al (2000)	Mod – 60%	<ul style="list-style-type: none"> • Experimental group recruited from clinical setting • Control participants excluded if had previous neurological disorder • Measure seemed good • Data gathered from child & parent 	<ul style="list-style-type: none"> • Control group recruited from non-clinical/community setting and were a convenience sample • Incentives given • All aetiologies included in the experimental group (including brain tumour, encephalitis etc) • Not stated whether participants excluded from either group for previous TBI
Turkstra et al (2004)	Mod – 60%	<ul style="list-style-type: none"> • Experimental group recruited from clinical setting • No incentives given • Post hoc power calculations carried out • Mean time >3 months post-injury • Participants excluded for previous neuro disorder • Participants from both groups excluded for previous neuro disorder • Data gathered from child alone 	<ul style="list-style-type: none"> • Relatively small sample size for experimental group • Experimental and control participants recruited from existing data pool, very little information given • Uneven mix of severities in TBI group (severe=17, mod=6) • Participants from both groups not excluded due to previous TBI • Measure used devised by authors

Appendix 2.3: Strengths and weaknesses of included studies (continued)

Study	Quality Rating	Strengths	Weaknesses
Warschausky et al (1997)	Mod – 53%	<ul style="list-style-type: none"> • Experimental group recruited from clinical setting • No incentives given • Measure used to assess social competency was good 	<ul style="list-style-type: none"> • Control group recruited from non-clinical/community setting • Control & experimental group self-selected • Experimental group self-selected • No power calculations • Small sample sizes • Mixed severity in experimental group (mild=6, mod=2, severe=6) • Participants not excluded from either group for previous TBI or neuro disorder • Data gathered from child alone
Turkstra et al (2001)	Low – 47%	<ul style="list-style-type: none"> • Experimental group recruited from clinical setting • No incentives given] • Post-hoc power calculations performed • Mean time >3months post-injury • Data gathered from child & parent 	<ul style="list-style-type: none"> • Control group recruited from community setting • All participants self-selected • Uneven mix of TBI severity (severe=8, mod=2) • Participants from both groups not excluded for previous TBI or neuro disorder • Measure used devised by authors
Pettersen (1991)	Low – 44%	<ul style="list-style-type: none"> • Experimental and control groups recruited from clinical settings • Mean time >3 months post-injury • Control participants excluded for having previous TBI or neuro disorder • Data gathered from child & parent 	<ul style="list-style-type: none"> • All participants self-selected • Incentives given to all participants • No power calculations • Small sample sizes • No data given on range severity of TBI • Experimental participants not excluded for previous TBI or neuro disorder • Measure used devised by authors

Appendix 3.1 – Original Major Research Project Proposal submitted to and passed by the Doctorate in Clinical Psychology training course

MAJOR RESEARCH PROJECT PROPOSAL

An investigation of social knowledge and communication in children under 13 years, following moderate to severe Head Injury.

Name: Ailish Flatley

Academic Supervisor: Professor Tom McMillan

Field Supervisor: Dr Liam Dorris

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

Summary:

The aim of this study is to investigate whether moderate to severely head injured children are less able to recognise emotion in others and have poorer social skills as rated by teachers and the children themselves. Furthermore, this study also aims to investigate whether there is an association between emotion recognition and social competence amongst the paediatric head injured population.

Using a between-groups design, it is hypothesised that children with moderate to severe head injury will perform less competently on the children's version of the "Reading the Mind in the Eyes" test (Baron-Cohen et al 2001) and the Matson Evaluation of Social Skills with Youngsters (Matson et al 1983), than a non-head injured control group.

The study will be carried out on a sample of children from 6 to 13 years of age who attended the Royal Hospital for Sick Children in Glasgow following a moderate or severe head injury. The control group will consist of Orthopaedic patients, who will be closely matched to the experimental groups in terms of age, sex and score on the British Picture Vocabulary Scale-Version II (BPVS II, Dunn et al 1997).

Introduction:

Head injury is extremely common in childhood. The majority of head injuries sustained by children are mild and therefore result in few functional sequelae. However, children who sustain relatively more serious head injuries may experience on-going cognitive and behavioural deficits. The causes of childhood head injury are diverse and, similar to the adult population the majority of injuries are related to road traffic accidents (Anderson, Northam, Hendy & Whennall 2001). However, amongst the paediatric population there is a higher incidence of head injuries resulting from falls, pedestrian accidents and non-accidental injury (for example as a result of abuse) than in the adult population. The circumstances leading to head injury in children vary with age and developmental level; with children under 3 years of age having the highest incidence (Anderson et al 2001) of head injuries. The nature of the injury also varies with age and developmental level. For example, infants are more likely to experience head injuries as a result of falls or child abuse. Pre-school children are at high risk of falls and pedestrian accidents, due to the high activity level of this age group. Adolescents and school-aged children, on the other hand, frequently sustain head injuries as a result of sporting, cycling or pedestrian accidents. Research suggests that fatalities decrease as age

increases, and that boys are more likely to sustain head injuries than their female counterparts (Anderson et al 2001). Also, several research studies have suggested that traumatic head injuries are more likely to occur amongst socially disadvantaged families, families where there is unemployment and emotional disturbance, and are likely to occur as a result of parental neglect and poor supervision (Anderson et al 2001).

A number of children who sustain head injury are hypothesised to be a “self-selecting” group (Middleton 2001). It was found that children with pre-existing concentration difficulties or who exhibited impulsive behaviour were at heightened risk of sustaining an injury to the head or elsewhere (Light, Asarnow, Satz, Zaucha, McCleary & Lewis 1998). Furthermore, Middleton (2001) suggested a higher incidence of pre-morbid behaviour difficulties amongst head-injured children. Hence, post-injury behavioural problems may be at least partially explained by these pre-existing difficulties (Ponsford, Willmott, Rothwell, Cameron, Ayton, Nelms, Curran & Ng 1999). Therefore, it has been suggested that the relationship between a head injury and post-injury behavioural problems cannot be assumed to be a causal one.

There is no doubt in the literature that moderate to severe head injury leads to a range of functional impairments. For example, depressed IQ is commonly reported following relatively more severe head injuries. Interestingly, studies have shown that even immediately post-injury, verbal IQ remains largely unaffected – potentially suggesting that “crystallised” knowledge (such as general knowledge or knowledge of words) may be less vulnerable to the negative effects of head injury. Performance IQ appears more likely to be affected and scores may decrease immediately post-injury and in the longer term (Anderson et al 2001). Taken together, the above findings could suggest that “fluid” skills (such as problem solving, reasoning, speed of processing and motor coordination) are more prone to negative outcome following head injury.

Despite research suggesting that “fluid” skills may be particularly vulnerable following head injury, previous research on neuropsychological outcomes has paid relatively little attention to the relationship between head injury in children and functional outcomes such as social knowledge and communication abilities or the ability to maintain friendships. This is perhaps surprising as emotional, social and behavioural disturbances are documented to occur in up to 30% of head injured children, and cause high levels of distress (Anderson, Catroppa, Haritou, Morse & Rosenfeld 2005). Furthermore, evidence from the adult literature suggests that

individuals who have experienced a traumatic head injury perceive social functioning as the most critical predictor of their quality of life (Warschausky, Argento, Hurvitz & Berg 2003). Thus it is viable to suggest that the attitudes of children with head injuries would echo this finding.

Previous studies of outcome following head injury have frequently focused on injuries sustained by older children or adolescents; individuals who are likely to have a range of established cognitive, behavioural and social skills (McKinley, Dalrymple-Alford, Harwood & Fergusson 2001). This older age group would arguably show a response to head injury that would follow the adult pattern of initial deficit followed by recovery. This fails to take into account the possibility that, as younger children are experiencing on-going active developmental change, the effects of a head injury in this population may be exacerbated through interactions with developmental processes. Therefore, in the longer term children with head injuries may be less able than their peers to acquire developmentally appropriate social skills.

Social competence is a complex construct involving many discrete skills that must be deployed in an integrated way in order to accurately interpret the behaviours of others and respond appropriately (Lewis, Morris, Morris, Krawiecki & Foster 2000). Haritou et al (1997 as cited in Anderson et al 2001) reported that preschool children with severe head injury produced less conversation and made more errors in conversation including poor topic maintenance, inappropriate turn-taking and inappropriate responses than normal controls. This could suggest that the head injured group were less socially competent than their non-head injured counterparts. Furthermore, in a study looking at solutions to hypothetical social scenarios, Warschausky et al (1997, as cited in Warschausky et al 2003) found that children with head injuries were relatively less assertive in their responses to hypothetical scenarios, in which they were asked how they might break into an ongoing peer activity, than an age-, sex-, socioeconomic status- and IQ-matched sample of their non-injured peers. The literature also suggests that the parents of head injured children frequently report that their children lack insight and appear insensitive to the needs and feelings of others. This may lead to difficulties in the classroom; head injured children often lose their past friends and peer group status and have difficulty integrating themselves into new groups of friends (Middleton 2001).

An important aspect of social competence is the ability to make inferences about the mental states of others, and use this to predict or explain their behaviour – so-called “Theory of Mind”. In order to accurately infer what another person is thinking or feeling one must be able to recognise and interpret the emotions communicated in social interactions. In a study with head injured adults (Havet-Thomassin, Allain, Etcharry-Bouyx & Le Gall, 2006) participants were asked to make inferences about the mental states of others by interpreting photographs showing only the eye-region of the face - the “Reading the Mind in the Eyes” test (Baron-Cohen, Wheelwright, Hill, Raste & Plumb 2001). Use of this measure has proved to be a reliable and valid way of assessing social intelligence or Theory of Mind in adults (Baron-Cohen et al 2001). Havet-Thomassin et al (2006) found that the severely head injured participants showed significantly impaired theory of mind abilities – they were unable to make accurate inferences about the mental states of others. Children typically develop theory of mind by the time they are six years old and several studies have already confirmed the link between ability to decode and recognise facial expressions, and social competence in children (Kupferberg, Morris & Bakeman 2001). Thus, following on from the findings of Havet-Thomassin et al (2006), the present study proposes that suffering a relatively severe head injury in childhood could either prevent optimal development of theory of mind, or impair existing abilities. It is proposed that this may partly account for the reduction in social competence often observed in head-injured children. Therefore, the proposed study would use the children’s version of the “Reading the Mind in the Eyes” test (Baron-Cohen, Wheelwright, Scahill, Spong & Lawson, 2001) to examine potential differences in ability to decode facial expressions and infer mental states, between children who have had head injuries and a non-head injured control group.

It would hence appear that there is potentially something to be gained by investigating theory of mind and social competence in the head-injured paediatric population. Naturalistic behavioural observations and behaviour ratings scales are proposed as the two methods of assessment that should be considered “first-line” choices for assessing the social skills of children and adolescents (Merrell 2001). However, in comparison to direct behavioural observations, behaviour ratings scales are less expensive in terms of the professional time involved and the amount of training required for use. Furthermore, behaviour rating scales provide data on low-frequency behaviours that may not be uncovered by a discrete period of direct observation, and utilise the observations and judgements of individual’s who are highly familiar with the young person’s behaviour – typically teachers (Merrell 2001). Although

teachers are able to observe children in the structured environment of the classroom as well as at play, it is perhaps important to take into account the subjective perception of the children themselves as awareness of social functioning may be critical in predicting outcomes following head injury (Warschausky et al 2003). Furthermore, it is widely accepted that multi-informant assessment is more reliable and valid than relying on a single source of information (Bell-Dolan & Allan 1998). The Matson Evaluation of Social Skills with Youngsters (MESSY; Matson et al 1983) is one such measure that benefits from a multi-informant approach and hence can be used by teachers and children alike. Therefore, the current study proposes to use this measure to assess the social skills of children with head injuries as compared to a non-head injured control group.

Aims & Hypotheses:

The aim of this study is to investigate whether moderately to severely head-injured children are less able to recognise emotion in others and have poorer social skills as rated by teachers and the children themselves. Furthermore, this study also aims to investigate whether there is an association between emotion recognition and social competence amongst the paediatric head injured population. The study will be carried out on children between the ages of 6 and 13 years old, who presented at the Royal Hospital for Sick Children in Glasgow following a head injury. Using a between-groups design, it is hypothesised that:

- Children with moderate to severe head injuries will be less able to recognise emotion in others, hence, will perform relatively more poorly on the children's version of the "Reading the Mind in the Eyes" test, than non-head injured controls.
- Children with moderate to severe head injuries will be less socially competent and hence will perform relatively more poorly on the Matson Evaluation of Social Skills with Youngsters (MESSY; Matson, Rotatori & Helsel 1983) than non-head injured controls.
- There will be a correlation between ability to recognise emotion in others and social competence for the experimental head-injured population.

Plan of Investigation:

Participants:

Experimental Group

The sample will consist of children from 6 to 13 years old who attended the Royal Hospital for Sick Children in Glasgow following Moderate or Severe Head Injury, as classified by the Glasgow Coma Scale. The age range has been defined in this way because over the age of 13 years individuals with head injuries attend their local hospital, and hence by limiting the sample to under 13 year olds a discrete population is potentially accessible. It is also proposed that participants should be at least three months post-injury to be included in this study, as this is the time frame within which post-concussive symptoms are thought to resolve in most cases (Anderson et al 2001).

The minimum criteria for inclusion in the experimental group will include:

- Experience of loss of consciousness following the traumatic brain injury.
- Admission to hospital following the traumatic brain injury.
- Post Traumatic Amnesia of at least one hour following the traumatic brain injury.
- Primary diagnosis of moderate or severe traumatic brain injury.

Hence, for inclusion in the experimental group, participants should have all, or a combination of, the above criteria.

Head injury classification will be as follows (Anderson et al 2001):

1. Moderate TBI:

- Loss of consciousness (LoC) exceeding 20 minutes
- Glasgow Coma Scale Score on admission of between 9 and 12.
- Post-traumatic amnesia (PTA) of at least one hour and at most 1 day

2. Severe TBI

- Loss of consciousness (LoC) exceeding 1 hour
- Glasgow Coma Scale Score on admission of 8 or less
- Post-traumatic amnesia (PTA) of more than 1 day.

Control Group

The proposed control group will consist of Orthopaedic patients (aged 13 years and under) who attend the Royal Hospital for Sick Children. The sample will consist of approximately 20 children with moderate to severe head injury, and approximately 20 Orthopaedic controls.

Participants will be excluded on the grounds of Learning Disability, developmental disorders, psychiatric disorders, or neurological disorders. Participants will be matched on age, sex and their score on the British Picture Vocabulary Scale II (BPVS II Dunn, Dunn, Whetton & Burley 1997)).

Recruitment:

The sample will be recruited through Accident and Emergency admissions at the Royal Hospital for Sick Children in Glasgow. A database is currently being developed to capture all admissions due to head injury at the Royal Hospital for Sick Children.

Measures:

Measures administered will include:

- The children's version of the Reading the Mind in the Eyes test (Baron-Cohen, Wheelwright, Scahill, Spong & Lawson 2001) – a theory of mind test in which participants are shown 28 photographs of the eye region of a human face and are asked to select from a list the word that best describes what the person in the picture is thinking or feeling. It is proposed that this test will be computerised to allow for analysis of response latency as well as response accuracy. Normally developing children are able to pass this test at approximately 6 years of age.
- The Matson Evaluation of Social Skills with Youngsters (MESSY; Matson et al 1983) – a 64-item rating scale to be completed by teachers and a 62-item self-rating scale to be completed by child participants, which together provide standardised assessment information regarding the frequency of a child's appropriate and inappropriate social behaviours. Respondents rate items on a five point Likert scale. Items refer to discrete observable behaviours rather than global personality traits and the measure is normed for use with children between 4 and 18 years of age. The MESSY (Matson et al 1983) has adequate test-retest and internal reliability as well as concurrent validity and is one of the most thoroughly researched child social skills ratings scales in the literature. Also, it has been used to assess a wide variety of children and hence appears suitable for use with the paediatric head injured population.

- The British Picture Vocabulary Scale Version 2 (BPVS II, Dunn, Dunn, Whetton & Burley 1997) – which will serve as a measure of receptive language skills and hence, verbal intellectual competence. This is important as the Theory of Mind test contains a verbal component

Design & Procedures:

The study will use a matched control between-group design, consisting of a moderate and severe head injury group and a group of matched non-brain injured Orthopaedic controls. Participants will be matched as closely as possible using BPVS II scores, current age and sex. The independent variable will be the groups themselves (either head injured or orthopaedic controls) and the dependent variables will be the scores obtained by participants on the Matson Evaluation of Social Skills with Youngsters test (MESSY; Matson et al 1983), and the children's version of the "Reading the Mind in the Eyes" test (Baron-Cohen, et al 2001).

An information sheet and consent form will be sent out to the parents of all potential participants. Once parental consent is gained, parents will be given the option of bringing their child to the Fraser of Allander Neurosciences Centre to undergo testing, or having their child tested in school. On meeting each child, it will be checked that they are agreeable to taking part in the present study. Child participants will then be asked to complete the self-report rating scale of the Matson Evaluation of Social Skills with Youngsters (MESSY; Matson et al 1983). To ensure their understanding, each child will be given brief instructions on completion of the ratings scale, and will have the opportunity to ask questions. Following completion of this measure, the BPVS II (Dunn et al 1997) and the children's version of the "Reading the Mind in the Eyes" Test will be administered to each child (Baron-Cohen et al 2001). The time required for individual subject participation will be a maximum of 1 hour.

The teachers of the children participating in the study will also be asked to complete the Matson Evaluation of Social Skills with Youngsters (Matson et al 1983). Initially, a letter will be sent to the Director of Education for Greater Glasgow outlining the present study's hypotheses and objectives. If authorisation is granted by the Director of Education, the Head Teachers of each school attended by participants will be written to. Consent to contact individual class teachers will be sought. If consent is gained, the teachers will receive a copy of the MESSY ratings scale and a covering letter giving them brief instructions on completion of the measure. A follow-up phone call will be made to each teacher, to ensure they

understand what they are being asked to do, and to give them the opportunity to ask questions. A stamped addressed envelop will be provided for the return of the completed ratings scales.

Settings & Equipment:

Data collection will take place within the Fraser of Allander Neuroscience centre at the Royal Hospital for Sick Children in Glasgow.

Power Calculation:

Power calculations, using the UCLA website, were based on related studies of emotion recognition and theory of mind following head injury: Havet-Thomassin et al (2006) compared performance on the “Reading the Mind in the Eyes” test for 17 individuals with severe head injury ($x = 20.6$, $SD = 4$) and 17 normal controls ($x = 27.6$, $SD = 2.7$). Power calculations for the present study therefore indicated that a minimum of 6 head injured participants and 6 controls would be required for a power of 0.8 and an alpha of 0.05.

Furthermore, Warschausky et al (2003) conducted a study comparing social problem solving in children with a history of traumatic brain injury and children with congenital brain abnormalities. Performance of the acquired brain injury group ($x = 20.27$, $SD = 5.64$) and the congenital brain abnormalities group ($x = 16.63$, $SD = 4.97$) were compared on the Social Problem Solving Measure. Power calculations based on this particular study suggest that a minimum of 29 head injured participants and 25 controls would be required for a power of 0.8 and an alpha of 0.05 if unequal variances were assumed.

Finally, Dorris et al (2004) conducted a study which investigated theory of mind in children with a sibling with Asperger’s syndrome compared to normal controls. The children’s version of the “Reading the Mind in the Eyes” test was administered to siblings ($x = 18.26$, $SD = 3.61$) and normal controls ($x = 20.04$, $SD = 4.35$). Power calculations for the present study based on this data suggest that a minimum of 57 head injured participants and 68 matched controls would be necessary for a power of 0.8 and an alpha of 0.05, if unequal variances were assumed.

Hence it would appear that there is much variation regarding the number of participants required to achieve a power of 0.8 and an alpha of 0.05 in the present study. It would however seem that the first two studies mentioned are most similar to the present study, and therefore

should be looked at in more detail. The Havet-Thomassin et al (2006) study compared a normal control group with severely brain injured individuals, the Warschausky et al (2003) study compared children with acquired brain injury with children who have congenital brain abnormalities, and the present study aims to compare moderate to severely brain injured children with an orthopaedic control group. With regards to the Havet-Thomassin et al (2006) study, as mentioned earlier it is hypothesised that there is relatively less differences between an orthopaedic control group and a traumatic brain injured group than between the latter and normal controls. Hence a greater number of participants would be needed for a study to highlight any differences between these two groups. With regards to the Warschausky et al (2003) study, it could similarly be argued that the orthopaedic paediatric population is more closely matched to the traumatic brain injured paediatric population than children with congenital brain abnormalities are. Hence it would appear that optimum group sizes for the current study may fall in between the numbers generated using the data from the Havet-Thomassin et al (2006) and the Warschausky et al (2003) studies. It would therefore seem viable to suggest that a minimum of 20 head injured participants and 20 matched orthopaedic controls would be necessary for the present study to achieve a power of 0.8 and an alpha of 0.05.

Data Analysis:

Data will be analysed using SPSS statistical software. In order to investigate whether the predicted group differences exist between the head-injured group and the non-head injured orthopaedic control group, a series of independent between-samples t-tests will be carried out. In order to investigate whether the hypothesised positive correlation exists between the ability to recognise emotions and social skills within the head-injured group, a correlational design will be used.

Practical Applications:

The proposed study has practical implications as identifying impairments in recognising emotion and social skills in children with moderate and severe head injury will promote better understanding of factors that contribute to the long-term adjustment of this group. Furthermore, it is important that professionals working with this population are aware of potential deficits in psychosocial skills in order to guide appropriate assessment and intervention.

Timescale:

The research proposal will be finalised by July 2006 and it is intended that ethical approval will have been gained by September 2006. Data collection is planned to begin in October 2006 and continue for a maximum of 6 months. The project completion date is Easter 2007.

Ethical Approval:

Ethical approval will be sought from the Yorkhill Research Ethics Committee. If any participants in the proposed study are found to have significant difficulties with emotion recognition and social communication, their families will be offered referral to Dr Liam Dorris (Consultant Clinical Psychologist at the Royal Hospital for Sick Children in Glasgow) for advice and support.

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Appendix 4.1 – Guidelines for contributors to Brain Injury

General Guidelines

This journal covers all aspects of brain injury from basic science, neurological techniques and outcomes to vocational aspects, with studies of rehabilitation and outcome of both patients and their families, It addresses both adult and paediatric issues and it embraces issues such as family and peer relationships, effects of alcohol and drugs, communication problems and management techniques and creating new programmes Brain Injury uses case studies to illustrate different approaches to a subject, and provides a forum for the appraisal of theories which may influence future research. Brain Injury is the official research journal of the International Brain Injury Association.

Contacting the Editors:

Jeffrey S. Kreutzer, Department of Physical Medicine & Rehabilitation, Virginia Commonwealth University, Medical College of Virginia Campus Richmond, VA 23298-0542, USA

Nathan D. Zasler, Concussion Care Centre of Virginia, 10120 VWest Broad Street, Suite G & H Glen Allen, VA 23060, USA

Associate Editors:

William W. McKinlay, Case Management Services Ltd, Edinburgh, UK.

Contacting Taylor & Francis

Production Editorial Department (Brain Injury), Taylor & Francis, 4 Park Square, Milton Park, Abingdon, Oxfordshire, OX14 4RN, UK

Submitting a paper to Brain Injury

All submissions should be made online at Brain Injurys Manuscript Central site New users should first create an account. Once a user is logged onto the site submissions should be made via the Author Centre.

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 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 condition they are the property (copyright) of the submitting author(s) and that copyright will be transferred to the journal Brain Injury and Taylor & Francis Ltd, if the paper is accepted.

Brain Injury considers all manuscripts on the strict condition that they 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.

- 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.

Appendix 4.1 – Guidelines for contributors to Brain Injury (continued)

Abstracts are required for all papers submitted, they should not exceed 200 words and should precede the text of a paper: see 'Abstracts'.

- Accepted manuscripts in their final, revised versions, should also be submitted as electronic word processing files on disk: see 'Electronic Processing'.

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

Electronic Processing

We welcome figures sent electronically, but care and attention to these guidelines are essential as importing graphics packages can often be problematic.

Figures must be saved individually and separate to text. Please do not embed figures in the paper file.

- Avoid the use of colour and tints for purely aesthetic reasons.
- Figures should be produced as near to the finished size as possible.
- All figures must be numbered in the order in which they appear in the paper (e.g. figure 1, figure 2). In multi-part figures, each part should be labelled (e.g. figure 1(a), figure 1(b)).
- 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 graphic should be descriptive of the graphic, e.g. Figure1, Figure2a.

- 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).

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.

Abstracts

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.

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Contributors are required to secure permission for the reproduction of any figure, table, or extensive (more than fifty word) extract from the text, from a source which is copyrighted - or owned - by a party other than Taylor & Francis or the contributor.

This applies both to direct reproduction or 'derivative reproduction' - when the contributor has created a new figure or table which derives substantially from a copyrighted source.

The following form of words can be used in seeking permission;

Dear [HOLDER]

i/we are preparing for publication an article entitled

[TITLE]

Appendix 4.1 – Guidelines for contributors to Brain Injury (continued).

to be published by Taylor & Francis Ltd in Brain Injury.

I/we should be grateful if you would grant us permission to include the following materials:

(STATE FIGURE NUMBER AND ORIGINAL SOURCE)

We are requesting non-exclusive rights in this edition and in all forms. It is understood, of course, that full acknowledgement will be given to the source.

Please note that Taylor & Francis are signatories of and respect the spirit of the STM Agreement regarding the free sharing and dissemination of scholarly information

Your prompt consideration of this request would be greatly appreciated.

Yours faithfully

Code of experimental ethics and practice

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

When experimental animals are used, state the species, strain, number used, and other pertinent descriptive characteristics.

For human subjects or patients, describe their characteristics.

For human participants in a research survey, secure the consent for data and other material - verbatim quotations from interviews, etc. - to be used.

When describing surgical procedures on animals, identify the pre anaesthetic and anaesthetic agents used and state the amount of concentration and the route and frequency of administration for each. The use of paralytic agents such as curare or succinylcholine, is not an acceptable substitute for anaesthetics. For other invasive procedures on animals, report the analgesic or tranquilizing drugs used if none were used, provide justification for such exclusion.

When reporting studies on unanaesthetized animals or on humans, indicate that the procedures followed were in accordance with institutional guidelines.

Specific permission for facial photographs of patients is required. A letter of consent must accompany the photographs of patients in which a possibility of identification exists. It is not sufficient to cover the eyes to mask identity.

Mathematics

Special care should be taken with mathematical scripts, especially subscripts and superscripts and differentiation between the letter 'ell' and the figure one, and the letter 'oh' and the figure zero. If your keyboard does not have the characters you need, it is preferable to use longhand, in which case it is important to differentiate between capital and small letters, K, k and x and other similar groups of letters. Special symbols should be highlighted in the text and explained in the margin. In some cases it is helpful to supply annotated lists of symbols for the guidance of the sub-editor and the typesetter, and/or a 'Nomenclature' section preceding the 'Introduction'.

For simple fractions in the text, the solidus / should be used instead of a horizontal line, care being taken to insert parentheses where necessary to avoid ambiguity, for example, $I/(n-1)$. Exceptions are the proper fractions available as single type on a keyboard.

Full formulae or equations should be displayed, that is, written on a separate line. Horizontal lines are preferable to solidi, for example:

$$611- 5h +q$$

$$3n + 3yz$$

$$9U$$

Appendix 4.1 – Guidelines for contributors to Brain Injury (continued)

But: a/b + c/d + aid

$P = (a + b + d)$

The solidus is not generally used for units: ms⁻¹ not m/s, but note electrons/s, counts/channel, etc.

Displayed equations referred to in the text should be numbered serially (1, 2, etc.) on the right hand side of the page. Short expressions not referred to by any number will usually be incorporated in the text.

Symbols should not be underlined to indicate fonts except for tensors, vectors and matrices, which are indicated with a wavy line in the manuscript (not with a straight arrow or arrow above) and rendered in heavy type in print: upright sans serif r (tensor), sloping serif r (vector) upright serif r (matrix).

Typographical requirements must be clearly indicated at their first occurrence, e.g. Greek, Roman, script, sans serif, bold, italic. Authors will be charged for corrections at proof stage resulting from a failure to do so.

Braces, brackets and parentheses are used in the order { } [], except where mathematical convention dictates otherwise (i.e. square brackets for commutators and anticommutators)

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. However, note also that Brain Injury does not aspire to be international in the ways that McDonald's restaurants or Hilton Hotels are 'international'; we much prefer papers that, where appropriate, reflect the particularities of each higher education system.

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

1. Brain Injury prefers US to 'American', USA to 'United States', and UK to 'United Kingdom'.
2. Brain Injury uses conservative British, not US, spelling, i.e. colour not color; behaviour (behavioural) not behavior; [programme not program; [practises not practices; centre not center; organization not organisation; analyse not analyze, etc.
3. Single 'quotes' are used for quotations rather than double "quotes", unless the 'quote is "within" another quote'.
4. Punctuation should follow the British style, e.g. 'quotes precede punctuation'.
5. 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.
6. Dashes (M-dash) should be clearly indicated in manuscripts by way of either a clear dash (-) or a double hyphen (- -).
7. 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.
8. Apostrophes should be used sparingly. Thus, decades should be referred to as follows: 'The 1 980s [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.
9. 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 [1 989a).
10. 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 [the 19th century] to the curriculum development work associated with the Nuffield Foundation [the 1960s], there has been a shift from heurism to constructivism in the design of [science courses'.
11. 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.
12. Material to be emphasized (italicized in the printed version) should be underlined in the typescript rather than italicized. Please use such emphasis sparingly.
13. n (not N), % (not per cent) should be used in typescripts.
14. 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).

Appendix 4.1 – Guidelines for contributors to Brain Injury (continued)

Notes on tables and figures

The same data should not be reproduced in both tables and figures. The usual statistical conventions should be used: a value written 10.0 ± 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.

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

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

Insert (able 2 about here

3. Each table and/or figure must have a title that explains its purpose without reference to the text,

4. Figures and tables must not be embedded in the text.

Thus tables and figures must be referred to in the text and numbered in order of appearance. Each table should have a descriptive title and each column an appropriate heading.

Citations in text

References should be cited using the numerical system (e.g. [[They should be listed separately at the end of the paper in the order in which they appear in the text. 'Ibid. (and the like) are not used when repeating citations.

Acknowledgements Any acknowledgements authors wish to make should be included in a separate headed section at the end of the manuscript.

Book reviews

1. The following header material should appear in all reviews in the following order (note also the punctuation):

Student Engagement and Achievement in the American Secondary School. Edited by Fred M. Newmann (Teachers College Press, New York, 1992), 240 pp., \$38.00 (hbk), ISBN 8077- 3183-8, \$17.95 (pbk), ISBN 8077-3182-X.

2. Page references within reviews should be given as follows: (p. 337) or (pp. 36-37).

References

References should follow the Council of Biology Editors (CBE) 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. Examples are provided as follows:

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

Book chapter: [Kuret JA, Murad F. Adenohypophyseal hormones and related substances. In: Gilman AG, Rall IW, 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: [Mangie ED. A comparative study of the perceptions of illness in New Kingdom Egypt and Mesopotamia of the early first millennium [Akron (OH): University of Akron; 1991. 160 p. Available from: University Microfilms, Ann Arbor MI; AAG9203425.

Appendix 4.1 – Guidelines for contributors to Brain Injury (continued)

Journal article on internet; [Loker WM. “Campesinos” and the crisis of modernization in Latin America. Jour of P01 Ecol [online] 1996; 3(1). Available: <http://w> via the INTERNET. Accessed 1996 Aug 11.

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

Internet databases; [Prevention News Update Database [Rockville (MD); Centers for Disease Control and Prevention (US) National Prevention Information Network. 1988 Jun - [2001 Apr 12].

Available from; <http://n.org/db/public/dnmain.htm>

Further examples and information can be found in the CBE style manual Scientific Style and Format, sixth edition.

Offprints and Reprints

Offprints and reprints of articles published in Brain Injury can be obtained through Rightslrnk ®. Please contact the Reprints Administrator Sherry Howard at reprints@ to obtain a quotation or to place an order. Copies of the Journal can be purchased separately at the author’s preferential rate of £15 00/\$25 00 per copy.

Colour figures

- a. Any figure submitted as a colour original will appear in colour in the journal’s online edition free of charge and can be downloaded.
- b. Paper copy colour reproduction will only be considered on condition that authors contribute to the associated costs. Charges are; £500/US\$900 for the first colour page and £250/US\$450 for each colour page after per article. (Colour costs will be waived for invited Review Articles)

Appendix 4.2 – Approval from Primary Care Ethics Committee

Appendix 4.2 – Approval from Primary Care Ethics Committee

Primary Care Division

Gartnavel Royal Hospital
1055 Great Western Road
Glasgow G12 0XH
Tel: 0141 211 3600
www.nhs.gov.uk



Miss Ailish Shona Flatley
Trainee Clinical Psychologist
Department of Psychological Medicine
Academic Centre
Gartnavel Royal Hospital
G12 0XH

Date 15 February 2007
Your Ref
Our Ref

Direct line 0141 211 3824
Fax 0141 211 3814
E-mail Liz.Jamieson@gartnavel.
glacomen.scot.nhs.uk

Dear Miss Flatley

Study title: An investigation of social knowledge and communication
in children under 13 years, following moderate to severe
Head Injury
REC reference: 06/S0701/139

Amendment number: AMO1
Amendment date: 30 January 2007

Thank you for submitting the above amendment, which was received on 30 January 2007. It is noted that this is a modification of an amendment previously rejected by the Committee (our letter of 19 January 2007 refers).

The modified amendment was considered at the meeting of the Sub-Committee of the REC held on 15 February 2007. A list of the members who were present at the meeting is attached.

Ethical opinion

I am pleased to confirm that the Committee has given a favourable ethical opinion of the modified amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved are:

Document	Version	Date
Modified Amendment		30 January 2007

Membership of the Committee

The members of the Ethics Committee who were present at the meeting are listed on the attached sheet.



D018181

Appendix 4.2 – Approval from Primary Care Ethics Committee (continued)

Appendix 4.2 – Approval from Primary Care Ethics Committee (continued)

Research governance approval

All investigators and research collaborators in the NHS should notify the R&D Department for the relevant NHS care organisation of this amendment and check whether it affects research governance approval of the research.

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.

06/S0701/139

Please quote this number on all correspondence

Yours sincerely



Liz Jamieson
Committee Co-ordinator

Copy to: R&D Department for NHS care organisation at lead site

Enclosures List of names and professions of members who were present at the meeting

Appendix 4.3 – Approval from Primary Care Research & Development

Appendix 4.3 – Approval from Primary Care Research & Development

Primary Care Division

Research & Development Directorate



Miss Ailish Shona Flatley
Trainee Clinical Psychologist
Department of Psychological Medicine
Academic Centre
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow
G12 0XH

Date 24 April 2007
Your Ref
Our Ref

Direct Line 0141 211 3661
Fax 0141 211 3814
Email brian.rae@ Gartnavel.gla.ac.uk
gartnavel.gla.ac.uk

Dear Miss Flatley

Study Title: An Investigation of Social Knowledge and Communication in Children Under 13 Years, Following Moderate to Severe Head Injury

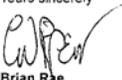
Project ID: PN06CP024

Amendment dated: 30th January 2007

The R&D Office has recently been informed of the amendment to the above study.

I am pleased to inform you that the amendment does not affect the original decision to grant R&D Management Approval.

Yours sincerely

PP 
Brian Rae
Research Manager



D370767

Appendix 4.4 – Approval from Yorkhill Research & Development

Appendix 4.4 – Approval from Yorkhill Research & Development

Women & Children's Directorate



Research & Development Office
1st Floor
RHSC
Dalhail St
Glasgow
G3 8SJ

NHS

Greater Glasgow
and Clyde

16th March 2006

Ms A Flatley
Trainee Clinical Psychologist
University of Glasgow
Department of Psychological Medicine
Academic Centre
Gartnavel Royal Hospital
G12 0XH

Yorkhill R&D Management Approval

Dear Ms Flatley,

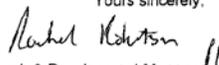
Re: An investigation of social knowledge and communication in children under 13 years, following moderate to severe Head injury
R&D Project Number: 06/RE/02, Ethics Ref: 06/S0701/139

Thank you for submitting a protocol and a copy of your ethics submission for the above project to the R&D Office. I am pleased to inform you that your project has been approved by the Yorkhill Division R&D department. This letter ensures that you and the researchers working with you, who hold substantive or honorary contracts, are indemnified by the NHS under the CNORIS scheme. This means you can now proceed with your project at Yorkhill once you have written confirmation of ethics approval for the study.

Amendments – The R&D office needs to be kept informed of any changes to the project for example regarding patient recruitment, funding, personnel changes or your project status. If changes are made to the protocol they will need to be considered by the ethics committee.

Should you have any queries please contact the R&D office quoting the Project ID number. Please let me know if the R&D office help in any way with the study. May I wish you every success with your research.

With very best wishes,
Yours sincerely,


Research & Development Manager

Appendix 4.5 – TBI group information sheets and consent form



[December 2006 – Version 3]
Parent Information Sheet-TBI



Thank you for taking the time to read this information sheet. I am a Final year Trainee Clinical Psychologist at the University of Glasgow. I am carrying out a study looking at how head injuries affect children's social skills, and am hoping to assess children who have had a head injury and their non-head injured peers. This kind of research can help increase our knowledge about the effects of head injury and help doctors, nurses and other medical staff provide children with better care.

Study: Social knowledge and communication in children following head injury.

Your child is being asked to take part in a research study, because they have been identified as having had a head injury. Before your child decides whether to take part, it is important for them to understand why the research is being done and what they will be asked to do. Please take the time to read the following information carefully. I have included a children's information sheet and would be grateful if you would read through it with your child to ensure their understanding. You can contact us if there is anything that is not clear or if you have any questions.

What is the purpose of this study?

This study is looking at whether head injuries affect children's social skills. I want to compare children who have had a head injury with children who have never injured their heads.

Why has my child been chosen?

All children aged between 6 and 16 years old who attended Yorkhill Hospital in Glasgow after injuring their head could be invited to take part in this study. I want to find out how children think they get on in social situations with their friends and families, and also how their teachers think they get on with their classmates. I will be talking to about 40 children and their teachers.

Does my child have to take part?

It is up to you and your child to decide whether or not they should take part. Please read the attached information sheets and fill out the consent form, indicating whether you and your child would like to take part, and return it to me in the envelope provided. If you and your child do decide to take part your child is free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part will not affect any on-going care your child may be receiving.

What will happen to my child if they take part?

Once I have received your signed consent form, and you have indicated that you and your child want to take part, I will access the medical notes relating to your child's head injury. I will do this so I can determine how serious their injury was, how long they spent in hospital and whether their treatment is on-going. I will also contact your child's teacher to let them

Appendix 4.5 – TBI group information sheets and consent form (continued)

know that your child is taking part in my study, and to let them know what my study is about. Your child will then be invited to meet with me once at Yorkhill Hospital. If applicable, travel expenses will be paid. When I meet your child I will explain what is involved to them and check that they are willing to take part. My meeting with your child should last for half an hour.

What will my child have to do?

I will ask your child to carry out a short test of word understanding, attention and memory. I will also ask your child to look at photographs of faces on a computer and ask them to guess what each person is thinking or feeling. I will then ask your child to answer some questions about how they behave in social situations with their friends and family members. After I have met up with your child, I will ask your child's teacher to answer some question about the ways in which your child interacts with their classmates.

What are the possible disadvantages and risks of taking part?

There are no real risks to taking part. Your child will not be asked to take any medication or give blood or take part in any other medical procedures as part of this research.

What are the possible benefits of taking part?

The information your child will give us will help doctors and medical staff understand more about the ways in which head injuries affect children. This will help doctors and medical staff provide better care for children who have head injuries.

Will my child taking part in this study be kept confidential?

All information collected from your child will be kept strictly confidential. Any information about them will have their name and address removed to prevent identification. Only the researchers (myself, Professor Tom McMillan and Dr Liam Dorris) will have access to the information gathered during my meeting with your child. All information will be stored in locked cabinets in accordance with the Data Protection Act 1998.

What will happen to the results of the research study?

This research is being carried out as part of a Doctorate in Clinical Psychology degree. It is intended that the results will be published in a journal specialising in head injury research. Your child will not be identified in any report or publication. You will be able to obtain a copy of the publication by contacting Ailish Flatley.

For further Information contact:

1. Ailish Flatley, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0607)
2. Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit (Tel: 0141 201 0780).
3. Professor Tom McMillan, Department of Psychological Medicine, University of Glasgow (Tel: 0141 211 0607)

Thank you very much for taking the time to read this information sheet.



[December 2006 – Version 3]



UNIVERSITY
of
GLASGOW

Children's Information Sheet – TBI

Project: Social skills after head injuries.

My name is Ailish Flatley and I am a Trainee Clinical Psychologist at the University of Glasgow. I would like to ask you to take part in my project. Sometimes children who have injured their heads can have problems getting on with friends and family, and this project may help doctors understand why this happens. In my project I would like to talk to some children who have had a head injury and some children who have not. Please talk to your parents/guardians about this project. If you have any questions you can ask me.

What is this project for?

I want to find out if children have any difficulties in social situations after they have had a head injury. I want to talk to some children who have injured their heads and some children who have not, and their teachers.

Why am I asking you to be in my project?

You are between 6 and 16 years old and have injured your head and been to the Royal Hospital for Sick Children in Glasgow.

Do you have to take part?

No. If you want to take part your parent/guardian will need to say it is ok. You can pull out at any time and you do not have to say why. This will not matter at all and any treatment you may get from the doctors and nurses and other staff will not be affected.

Appendix 4.5 – TBI group information sheets and consent form (continued)

What will happen in the project?

I will read the notes made by the doctors who helped you when you had to go to hospital, so I know what happened to you. I will arrange a time to meet you at Yorkhill Hospital, so this might mean that you have an extra visit if you are already seeing a doctor or nurse there. We will only meet up once.

What will you have to do?

When we meet up I will ask you to do some tasks, one of which will be looking at photographs of faces on a computer and guessing what the person is thinking or feeling. You will also be asked some questions about what you are like when you are with your friends and family. After we have met up, I will ask your teacher to answer some questions about what you are like when you are with the other children in your class.

Will my taking part in this study be kept private?

Your name and address will be kept private. I will tell your Family and Hospital doctors that you are taking part and I will send them a page about the project just like this one. Your class teacher will be told that you are taking part in my project and will be asked to answer some questions.

What will happen to the results of this project?

The results might be published in a magazine for doctors about head injuries. People reading this magazine will not know that you have taken part in the project. You will be able to get a copy of the article from me (Ailish Flatley).

For further Information contact:

Appendix 4.5 – TBI group information sheets and consent from (continued)

1. Ailish Flatley, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0607)
2. Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit, (Tel: 0141 201 0780)
3. Professor Tom McMillan, Department of Psychological Medicine, University of Glasgow (Tel: 0141 211 0607)

Thank you for reading this page.

Appendix 4.5 – TBI group information sheets and consent from (continued)



[December 2006 – Version 3]
Parent/Guardian Consent Form – TBI



Title of Study: An investigation of social knowledge and communication in children, following head injury.

**Please
initial box**

1. I confirm that myself and my child have read and understood the information sheet dated December 2006 for the above study and have had the opportunity to ask questions.
2. I understand that my child's participation is voluntary and that I am free to withdraw my child at any time without giving any reason, without their medical care or legal rights being affected.
3. I agree to my child's medical notes (regarding their head injury) being accessed as part of this research study. I understand that only clinicians involved in the study will have access to the information contained in these notes.
4. I agree to my child's teacher being contacted as part of this research study.
5. I agree to my child taking part in the above study, and my child agrees to take part.

Name of Parent/Guardian Date Signature

_____ (*Please provide a contact telephone number*)

Name of Child Date Signature

Witness Date Signature

Child's School: _____

Class Teacher: _____

Appendix 4.6 – Control group information sheets and consent form



[December 2006 – Version 3]
Parent Information Sheet-Controls



Thank you for taking the time to read this information sheet. I am a Final year Trainee Clinical Psychologist at the University of Glasgow. I am carrying out a study looking at how head injuries affect children's social skills, and am hoping to assess children who have had a head injury and their non-head injured peers. This kind of research can help increase our knowledge about the effects of head injury and help doctors, nurses and other medical staff provide children with better care.

Study: Social knowledge and communication in children following head injury.

Your child is being asked to take part in a research study. I realise that your child may not have had a head injury, but I am interested in comparing children who have had a head injury with children who have not. Before your child decides whether to take part, it is important for them to understand why the research is being done and what they will be asked to do. Please take the time to read the following information carefully. I have included a Children's Information sheet and would be grateful if you would read through it with your child to ensure their understanding. You can contact us if there is anything that is not clear or if you have any questions.

What is the purpose of this study?

This study is looking at whether head injuries affect children's social skills. I want to compare children who have had a head injury with children who have never injured their heads.

Why has my child been given an information pack?

All children aged between 6 and 16 years old who attend mainstream Primary or Secondary school within the Greater Glasgow area could be invited to take part in this study. I want to find out how children think they get on in social situations with their friends and families, and also how their teachers think they get on with their classmates. I will be talking to about 40 children and their teachers. I only need a small number of children from your child's school, so even if you do decide to take part there is a chance that your child will not be chosen to participate in this study.

Does my child have to take part?

It is up to you and your child to decide whether or not they should take part. Please read the attached child information sheet and fill out the consent form, indicating whether you and your child would like to take part. Your child is free to withdraw at any time and without giving a reason. If your child is chosen to take part, they will form the "control group" for this study – that is, the group that the head-injured children will be compared to. For this reason it is very important that I make sure that no children in the "control group" have ever had a head injury or any sort of neurological disorder. To help me do this, please indicate whether your child meets any of this study's exclusion criteria on the attached sheet, and return it to me along

Appendix 4.6 – Control group information sheets and consent form (continued)

with the consent form. You can return these forms to me by putting them in the envelope provided and giving them back to your child to take into school, where I will collect them.

What will happen to my child if they take part?

Once I have received your signed consent form, I will arrange a time to come to your child's school and meet your child. When I meet your child I will explain what is involved to them and check that they are willing to take part. My meeting with your child should last for half an hour.

What will my child have to do?

I will ask your child to carry out a short test of word understanding, attention and memory. I will also ask your child to look at photographs of faces on a computer and ask them to guess what each person is thinking or feeling. I will then ask your child to answer some questions about how they behave in social situations with their friends and family members. After I have met up with your child, I will ask your child's teacher to answer some question about the ways in which your child interacts with their classmates.

What are the possible disadvantages and risks of taking part?

There are no real risks to taking part. Your child will not be asked to take any medication or give blood or take part in any other medical procedures as part of this research.

What are the possible benefits of taking part?

The information your child will give us will help doctors and medical staff understand more about the ways in which head injuries affect children. This will help doctors and medical staff provide better care for children who have head injuries.

Will my child taking part in this study be kept confidential?

All information collected from your child will be kept strictly confidential. Any information about them will have their name and address removed to prevent identification. Only the researchers (myself, Professor Tom McMillan and Dr Liam Dorris) will have access to the information gathered during my meeting with your child. All information will be stored in locked cabinets in accordance with the Data Protection Act 1998.

What will happen to the results of the research study?

This research is being carried out as part of a Doctorate in Clinical Psychology degree. It is intended that the results will be published in a journal specialising in head injury research. Your child will not be identified in any report or publication. You will be able to obtain a copy of the publication by contacting Ailish Flatley.

For further Information contact:

1. Ailish Flatley, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0607)
2. Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit (Tel: 0141 201 0780).
3. Professor Tom McMillan, Department of Psychological Medicine, university of Glasgow (Tel: 0141 211 0607)

Thank you very much for taking the time to read this information sheet.



[December 2006 – Version 3]

Children's Information Sheet – Controls

Project: Social skills after head injuries.



UNIVERSITY
of
GLASGOW

My name is Ailish Flatley and I am a Trainee Clinical Psychologist at the University of Glasgow. I would like to ask you to take part in my project. Sometimes children who have injured their heads can have problems getting on with friends and family, and this project may help doctors understand why this happens. I understand that you may not have had a head injury, but in my project I would like to talk to some children who have had a head injury and some children who have not. Please talk to your parents/guardians about this project. If you have any questions you can ask me.

What is this project for?

I want to find out if children have any difficulties in social situations after they have had a head injury. I want to talk to some children who have injured their heads and some children who have not, and their teachers.

Why am I asking you to be in my project?

You are between 6 and 16 years old and attend a mainstream Primary or Secondary School within the Greater Glasgow & Clyde area.

Do you have to take part?

No. If you want to take part your parent/guardian will need to say it is ok. You can pull out at any time and you do not have to say why. I only need to meet with a small number of children from your school, so even if you are willing to be involved there is a chance that you will not be chosen to take part.

Appendix 4.6 Control group information sheet and consent form (continued)

What will happen in the project?

I will arrange a time to come to your school and meet you. When we meet up you will leave your classroom for about half an hour and go to another room in your school with me. We will only meet up once.

What will you have to do?

When we meet up at your school I will ask you to do some tasks, one of which will be looking at photographs of faces and guessing what the person is thinking or feeling. You will also be asked some questions about what you are like when you are with your friends and family. After we have met up, I will ask your teacher to answer some questions about what you are like when you are with the other children in your class.

Will my taking part in this study be kept private?

Your name and address will be kept private. Your class teacher will be told that you are taking part in my project and will be asked to answer some questions.

What will happen to the results of this project?

The results might be published in a magazine for doctors about head injuries. People reading this magazine will not know that you have taken part in the project. You will be able to get a copy of the article from me (Ailish Flatley).

For further Information contact:

1. Ailish Flatley, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0607)
2. Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit, (Tel: 0141 201 0780)

Appendix 4.6 Control group information sheet and consent form (continued)

3. Professor Tom McMillan, Department of Psychological Medicine,
University of Glasgow (Tel: 0141 211 0607)

Thank you for reading this page.

Appendix 4.6 Control group information sheet and consent form (continued)



[December 2006 – Version1]
Control Group Exclusion Criteria



Please indicate whether, to your knowledge, your child meets any of the following exclusion criteria:

- Learning Disability *[tick box]*

- Developmental Disorder

- Psychiatric Disorder

- Neurological Disorder

- Is English your child's first language? YES/NO *[delete as appropriate]*

Please return this form to me along with the completed consent form, indicating whether you and your child are interested in taking part in the research. You can return these forms to me by putting them in the envelope provided and giving them back to your child to take into school, where I will collect them.

Thank you for taking the time to complete this sheet.

Ailish Flatley
Trainee Clinical Psychologist
Department of Psychological Medicine
Division of Community Based Sciences
Academic Centre
Gartnavel Royal Hospital
Glasgow
G12 0XH
Tel: 0141 211 0607
Email: 0406296f@student.gla.ac.uk

Appendix 4.6 Control group information sheet and consent form (continued)



[December 2006 – Version 3]
Parent/Guardian Consent Form – Controls



Title of Study: An investigation of social knowledge and communication in children, following head injury.

**Please
initial box**

1. I confirm that myself and my child have read and understood the information sheet dated December 2006 for the above study and have had the opportunity to ask questions.
2. I understand that my child's participation is voluntary and that I am free to withdraw my child at any time without giving any 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 obtained in this study.
4. I agree to my child's teacher being contacted as part of this research study.
5. I agree to my child taking part in the above study, and my child agrees to take part.

Name of Parent/Guardian Date Signature

_____ (*Please provide a contact telephone number*)

Name of Child Date Signature

Witness Date Signature

Child's School: _____

Class Teacher: _____

Appendix 4.7 – Approval from Director of Education for Greater Glasgow

Appendix 4.7 – Approval from Director of Education for Greater Glasgow



Glasgow
CITY COUNCIL

Phone 0141-287 4551
Fax 0141-287 4895
Our Ref RO/C/SLA169 Your Ref
Date 26 January 2007
If phoning please ask for

Executive Director
(Education, Training & Young People)
Ronnie O'Connor
BA(Hons) DipEd

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

Ms Ailish Flatley
Trainee Clinical Psychologist
Department of Psychological Medicine
Division of Community Based Sciences
Academic Centre
Gartnavel Royal Hospital
GLASGOW
G12 0XH

Dear Ms Flatley

**AN INVESTIGATION OF SOCIAL KNOWLEDGE & COMMUNICATION
IN CHILDREN UNDER 13 YEARS, FOLLOWING MODERATE TO
SEVERE HEAD INJURY**

I refer to your recent letter in which you seek permission to approach Glasgow City Council schools requesting that they participate in the above research which you wish to undertake.

I have no objection to you approaching schools but I would stress that any visiting staff must have appropriate Disclosure checks and that no administrative burden should be placed on schools. The final decision to participate in the study would lie with individual head teachers.

I trust this is helpful to you.

Yours sincerely

RONNIE O'CONNOR
Executive Director (Education, Training and Young People)

Support Scotland's Bid to host the 2014 Commonwealth Games in Glasgow
glasgow2014.com

Glasgow City Council is an equal opportunities employer

Appendix 4.8 – Teacher information sheet and consent form



[December 2006 – Version 3]
Teacher Information Sheet



Thank you for taking the time to read this information sheet. I am a final year Trainee Clinical Psychologist at the University of Glasgow. I am carrying out a study looking at how head injuries may potentially affect children's social knowledge and communication. I hope to compare children who have had a head injury with their non-head injured peers. This kind of research can help increase our knowledge about the effects of head injury and help us provide children with better care.

Study: An investigation of social knowledge and communication in children, following head injury.

I am asking you to take part in this research study. Before you decide whether to take part, it is important for you to understand why the research is being done and what you will be asked to do. Please contact me if you have any questions.

What is the purpose of this study?

This study is looking at whether head injuries affect children's social skills. I want to compare children who have had a head injury with their non-head injured peers.

Why has my pupil being chosen?

All children aged between 6 and 16 years old who attended the Royal Hospital for Sick Children in Glasgow after injuring their head could be invited to take part in this study. Also all children aged between 6 and 16 years who attend mainstream Primary and Secondary schools within the Greater Glasgow & Clyde area could be invited to take part. Your pupil may be from either group. I want to find out how children think they get on in social situations with their friends and families, and also how their teachers think they get on with their classmates. I will be talking to about 40 children and their teachers.

Does my pupil have to take part?

It is up to the parent/guardian and the child to decide whether or not they should take part. Your pupil and their parent/guardian have been given information sheets about this study, and will have already signed a consent form giving me their permission to contact you. Your pupil is free to withdraw from this study at any time and without giving a reason. A decision to withdraw at any time will not affect any on-going care that your pupil may be receiving.

Do I have to take part?

No. It is up to you to decide whether you want to take part in this study or not. If, after reading this information sheet, you decide that you do want to take part in this study please read and sign the attached consent form. If you decide that you want to take part in this study you are free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part will not affect any on-going care your pupil may be receiving.

Appendix 4.8 – Teacher information sheet and consent form (continued)

What will happen if I take part?

If you have decided to take part, after you have signed the attached consent form please complete the 64-item Teacher Rating scale from the Matson Evaluation of Social Skills with Youngsters (MESSY) included in this pack. Please find attached a covering letter giving you brief instructions on how to complete this ratings scale. The MESSY provides scales for both appropriate (for example “Helps a friend who is hurt”) and inappropriate social skills (for example “Gives other children dirty looks”) so you will not have to focus exclusively on the negative aspects of your pupil’s behaviour. The MESSY should take about 10 minutes to complete. You will also be asked to indicate how long you have known the child in question and how long you have been qualified as a teacher. If you have any questions, please do not hesitate to contact me either by telephone, or by email. My contact details are provided at the end of this letter. A stamped addressed envelope will be provided for the return of the signed consent form and the completed ratings scale.

What will my pupil have to do?

I will arrange to meet your pupil either at school or within the Fraser of Allander Neurosciences Unit at Yorkhill Hospital. When we meet up I will ask your pupil to carry out a short test of word understanding, attention and memory which should take about 10 minutes. I will also ask your pupil to look at photographs of faces on a computer and ask them to guess what each person is thinking or feeling. I will then ask your pupil to answer some questions about how they behave in social situations with their friends and family members. My meeting with your pupil should take no more than one hour.

What are the possible disadvantages and risks of taking part?

Taking part involves no real risks to yourself or your pupil. Your pupil will not be asked to take any medication or give blood or take part in any other medical procedures as part of this research.

What are the possible benefits of taking part?

The information you give us regarding your pupil will help doctors and medical staff understand more about the ways in which head injuries affect children. This will help doctors and medical staff provide better care for children who have head injuries.

Will my taking part in this study be kept confidential?

All information collected regarding your pupil will be kept strictly confidential. Any information gathered will have your name and school address removed to prevent identification, along with the name and address of your pupil. Only the researchers (myself, Professor Tom McMillan, Dr Liam Dorris) will have access to the information gathered for the purposes of this study. All information will be stored in locked cabinets in accordance with the Data Protection Act 1998.

What will happen to the results of the research study?

This research is being carried out as part of a Doctorate in Clinical Psychology degree. It is intended that the results will be published in a scientific journal specialising in head injury research. Your pupil will not be identified in any report or publication. You will be able to obtain a copy of the publication by contacting myself (Ailish Flatley).

Appendix 4.8 – Teacher information sheet and consent form (continued)

For further Information contact:

1. Ailish Flatley, Trainee Clinical Psychologist, Department of Psychological Medicine, Gartnavel Royal Hospital (Tel: 0141 211 0607)
2. Dr Liam Dorris, Consultant Paediatric Neuropsychologist, Fraser of Allander Neurosciences Unit (Tel: 0141 201 0780).
3. Professor Tom McMillan, Department of Psychological Medicine, University of Glasgow (Tel: 0141 211 0607).

Thank you very much for taking the time to read this information sheet.

Appendix 4.8 – Teacher information sheet and consent form (continued)



[December 2006 – Version 3]
Teacher Consent Form



Title of Study: An investigation of social knowledge and communication in children, following head injury.

**Please initial
Box**

1. I confirm that I have read and understood the information sheet dated December 2006 for the above study and have had the opportunity to ask questions.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my pupil's medical or legal rights being affected.

3. I agree to taking part in this study

Name of Teacher

Date

Signature

Name of School

Witness

Date

Signature

Appendix 4.9 - Participant responses to Reading the Mind in the Eyes test items

Table 4: Participant responses

	TBI Group Responses (N=15)				Control Group Responses (N=15)			
P	Jealous 4	Scared 8	Relaxed	Hate 3	Jealous 1	Scared 13	Relaxed 1	Hate 0
1	Hate 3	Surprised 2	Kind 6	Cross 4	Hate 3	Surprised 3	Kind 6	Cross 3
2	Unkind 4	Cross 0	Surprised 0	Sad 11	Unkind 2	Cross 0	Surprised 0	Sad 13
3	Friendly 5	Sad 2	Surprised 1	Worried 7	Friendly 7	Sad 1	Surprised 1	Worried 6
4	Relaxed 0	Upset 15	Surprised 0	Excited 0	Relaxed 0	Upset 15	Surprised 0	Excited 0
5	Feeling sorry 7	Making somebody do something 5	Joking 1	Relaxed 2	Feeling sorry 3	Making somebody do something 12	Joking 0	Relaxed 0
6	Hate 1	Unkind 1	Worried 6	Bored 7	Hate 0	Unkind 0	Worried 6	Bored 9
7	Feeling sorry 1	Bored 5	Interested 7	Joking 2	Feeling sorry 3	Bored 0	Interested 10	Joking 2
8	Remembering 11	Happy 0	Friendly 0	Angry 4	Remembering 11	Happy 0	Friendly 0	Angry 4
9	Annoyed 1	Hate 1	Surprised 0	Thinking 13	Annoyed 0	Hate 0	Surprised 1	Thinking 14
10	Kind 0	Shy 2	Not Believing 11	Sad 2	Kind 0	Shy 1	Not Believ 14	Sad 0
11	Bossy 0	Hoping 7	Angry 2	Disgusted 6	Bossy 1	Hoping 10	Angry 0	Disgusted 4
12	Confused 3	Joking 2	Sad 0	Serious 10	Confused 0	Joking 0	Sad 0	Serious 15

Appendix 4.9 – Participant responses to the Reading the Mind in the Eyes test items (continued)

Table 4: Participant responses

	TBI Group Responses (N=15)				Control Group Responses (N=15)			
13	Thinking 6	Upset 6	Excited 1	Happy 2	Thinking 10	Upset 1	Excited 0	Happy 4
14	Happy 1	Thinking 10	Excited 0	Kind 4	Happy 0	Thinking 11	Excited 2	Kind 2
15	Not Believing 8	Friendly 0	Wanting to play 3	Relaxed 4	Not Believing 7	Friendly 0	Wanting to play 1	Relaxed 7
16	Made up her mind 10	Joking 0	Surprised 2	Bored 3	Made up her mind 10	Joking 1	Surprised 1	Bored 3
17	Angry 2	Friendly 0	Unkind 1	A bit worried 12	Angry 0	Friendly 2	Unkind 2	A bit worried 11
18	Thinking about something sad 13	Angry 1	Bossy 0	Friendly 2	Thinking about something sad 11	Angry 0	Bossy 1	Friendly 3
19	Angry 2	Daydreaming 8	Sad 1	Interested 4	Angry 0	Daydreaming 6	Sad 1	Interested 8
20	Kind 0	Surprised 0	Not pleased 14	Excited 1	Kind 0	Surprised 0	Not pleased 15	Excited 0
21	Interested 5	Joking 5	Relaxed 3	Happy 2	Interested 9	Joking 0	Relaxed 3	Happy 3
22	Playful 1	Kind 2	Surprised 1	Thinking 11	Playful 1	Kind 0	Surprised 2	Thinking 12
23	Surprised 1	Sure about something 10	Joking 2	Happy 2	Surprised 0	Sure about something 13	Joking 0	Happy 2

Appendix 4.9 –Participant responses to the Reading the Mind in the Eyes test items (continued)

Table 4: Participant responses

	TBI Group Responses (N=15)				Control Group Responses (N=15)			
24	Serious 10	Ashamed 4	Confused 0	Surprised 1	Serious 10	Ashamed 4	Confused 1	Surprised 0
25	Shy 2	Guilty 7	Daydreaming 0	Worried 6	Shy 2	Guilty 8	Daydreaming 1	Worried 4
26	Joking 0	Relaxed 1	Nervous 12	Sorry 2	Joking 1	Relaxed 2	Nervous 9	Sorry 3
27	Ashamed 2	Excited 0	Not believing 10	Pleased 3	Ashamed 1	Excited 0	Not believing 8	Pleased 6
28	Disgust 4	Hate 1	Happy 2	Bored 8	Disgust 2	Hate 2	Happy 10	Bored 1

Appendix 4.10 – MESSY subscales

Table 5 : Mean scores achieved on the MESSY subscales

Subscale	TBI	Control
MESSY Appropriate	49.53 (14.89)	45.27 (11.46)
MESSY Inappropriate	23.0 (6.94)	23.33 (4.14)
MESSY Impulsive	10.73 (3.22)	8.93 (2.43)
MESSY Overconfident	9.07 (2.84)	8.67 (2.50)
MESSY Jealous	6.47 (1.92)	7.20 (2.21)
MESSY Miscellaneous	20.33 (4.24)	19.33 (4.52)

Appendix 5.1 Guidelines for contributors to the Journal of Consulting & Clinical Psychology

Appendix 5.1 Guidelines for contributors to the Journal of Consulting & Clinical Psychology

Instructions to Authors

Journal of Consulting and Clinical Psychology

The *Journal of Consulting and Clinical Psychology* publishes original contributions on the following topics: (a) the development, validity, and use of techniques of diagnosis and treatment of disordered behavior; (b) studies of populations of clinical interest, such as hospitals, prison, rehabilitation, geriatric, and similar samples; (c) cross-cultural and demographic studies of interest for the behavior disorders; (d) studies of personality and of its assessment and development where these have a clear bearing on problems of clinical dysfunction; (e) studies of gender, ethnicity, or sexual orientation that have a clear bearing on diagnosis, assessment, and treatment; or (f) methodologically sound case studies pertinent to the preceding topics. The *Journal of Consulting and Clinical Psychology* considers manuscripts dealing with the diagnosis or treatment of abnormal behavior but does not consider manuscripts dealing with the etiology or descriptive pathology of abnormal behavior, which are more appropriate to the *Journal of Abnormal Psychology*. Articles that appear to have a significant contribution to both of these broad areas may be sent to either journal for editorial decision. Papers of a theoretical nature will occasionally be considered within the space limitations of the journal.

Style of manuscripts. Authors should prepare manuscripts according to the *Publication Manual of the American Psychological Association* (4th ed.). Typing instructions (all copy must be double-spaced) and instructions on preparing tables, figures, references, metrics, and abstracts appear in the *Manual*. Also, all manuscripts are copyedited for bias-free language (see chap. 2 of the *Publication Manual*). Original color figures can be printed in color provided the author agrees to pay half of the associated production costs.

Publication policies. Authors are required to obtain and provide to APA all necessary permissions to reproduce any copyrighted work, including, for example, test instruments and other test materials or portions thereof.

APA policy prohibits an author from submitting the same manuscript for concurrent consideration by two or more publications. In addition, it is a violation of APA Ethical Principles to publish "as original data, data that have been previously published" (Standard 6.24). As this journal is a primary journal that publishes original material only, APA policy prohibits as well publication of any manuscript that has already been published in whole or substantial part elsewhere. Authors have an obligation to consult journal editors concerning prior publication of any data upon which their article depends. In addition, APA Ethical Principles specify that "after research results are published, psychologists do not withhold the data on which their conclusions are based from other competent professionals who seek to verify the substantive claims through reanalysis and who intend to use such data only for that purpose, provided that the confidentiality of the participants can be protected and unless legal rights concerning proprietary data preclude their release" (Standard 6.25). APA expects authors submitting to this journal to adhere to these standards. Specifically, authors of manuscripts submitted to APA journals are expected to have available their data throughout the editorial review process and for at least 5 years after the date of publication.

Authors will be required to state in writing that they have complied with APA ethical standards in the treatment of their sample, human or animal, or to describe the details of treatment. A copy of the APA Ethical Principles may be

obtained by writing the APA Ethics Office, 750 First Street, NE, Washington, DC 20002-4242.

Abstracts. Manuscripts must be accompanied by an abstract containing a maximum of 960 characters and spaces (which is approximately 120 words). All abstracts must be typed on a separate sheet of paper.

Brief Reports. The *Journal of Consulting and Clinical Psychology* will accept Brief Reports of research studies in clinical psychology. The procedure is intended to permit the publication of soundly designed studies of specialized interest or limited importance that cannot now be accepted as regular articles because of lack of space.

An author who submits a Brief Report must agree not to submit the full report to another journal of general circulation. The Brief Report should give a clear, condensed summary of the procedure of the study and as full an account of the results as space permits. Brief Reports should be prepared according to the following specifications:

Set the character/space limit at 60 characters per line and do not exceed 410 lines for text and references. These limits do not include the title page, abstract, author note, footnotes, tables, or figures.

This journal no longer requires an extended report. However if one is available, the Brief Report must be accompanied by the following footnote:

Correspondence concerning this article (and requests for an extended report of this study) should be addressed to (give the author's full name and address).

Letters to the Editor. Submitted letters to the editor will be considered for publication in the next available issue of the journal. Letters should be used to comment on articles published in the two most recent issues of *JCCP* or to provide significant related information that can be communicated in a very brief format. The determination of the acceptance of a letter to the editor for publication in the journal will be the sole responsibility of the editor. The editor reserves the right to solicit and publish replies to an accepted letter to the editor and also reserves the right to edit for clarity all accepted material prior to publication.

Letters are to be submitted in triplicate and are to begin with "Dear Editor." An author of a letter to the editor must also submit a separate signed correspondence indicating that the accompanying Letter to the Editor is being submitted for consideration for publication. Submitted letters are to be double-spaced and, in general, should not exceed 500 words. References should be kept to the very minimum (fewer than five). Tables and figures are discouraged (no more than one, and none is preferred).

Submitting manuscripts. Five copies of manuscripts should be submitted, and all copies should be clear, readable, and on paper of good quality. A dot matrix or unusual typeface is acceptable only if it is clear and legible. In addition to addresses and phone numbers, authors should supply electronic mail addresses and fax numbers, if available, for potential use by the editorial office and later by the production office. Authors should keep a copy of the manuscript to guard against loss. The Editor is receiving all submissions to the journal. Mail manuscripts to the Editor, Philip C. Kendall, *Journal of Consulting and Clinical Psychology*, Department of Psychology, Weiss Hall, 1701 North 13th Street, Temple University, Philadelphia, PA 19122-6085.