The Development of Theory of Mind in Deaf People

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Declaration

The work has not been submitted for any other degree or to any other institution

Structure and Word Counts

Literature Review - Prepared according to the guidance of the British Journal of Developmental Psychology

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[1] Copies of the letter of approval and guidance notes for contributors are included in Section IV: Appendix A 1.

Thesis Abstract

Section I: Literature Review

Several authors claim that deaf children with hearing parents do not develop theory of mind (ToM) until adolescence, but this is largely based on false-belief studies. Peterson & Siegal's (2000) review of false-belief studies is updated and the section also reviews research using a wider range of methodologies with deaf children and adults. Deaf children have difficulties in false-belief, perspective-taking and emotional responses/reactions, but these skills may develop later. In contrast, deaf children do not appear to have deficits in mental-state attribution or emotional recognition. More research with deaf adults is needed.

Section II: Research Report

This study explores whether Deaf adults have impairments in ToM and empathy compared to hearing adults, and if Deaf forensic patients have further impairments. Tests were adapted and translated for the purpose of the study. The Deaf community scored lower than the hearing community on the Reading the Mind in the Eyes test and produced fewer mental states. The Deaf forensic group was too small for reliable statistical analysis. Deaf people may continue to have ToM impairments into adulthood, but the results could be due to methodological, linguistic and social factors. Assessments must be developed specifically for use with Deaf populations rather than relying on interpreted measures.

Section III: Critical Appraisal

This section gives a commentary, and personal reflections, on the project. The challenges faced during the progression through the thesis and of researching within the Deaf culture are explored. Methodological problems, clinical implications and areas for further research are discussed and key learning points are identified.

Dedication

For Nana Lorna and Dolores

Acknowledgements

Firstly I would like to thank the 25 people who participated in this project for generously and freely giving their time to take part.

Many thanks to Alpha Hospitals, Bury, who supported the project by providing me access to staff, patients and interpreters. Thanks also to the Sheffield Research Consortium and the Clinical Psychology Unit for funding this project.

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SECTION I: Literature Review

The Development of Theory of Mind and Emotional Understanding in Deaf People: Considering Procedural Issues

Abstract

Based exclusively on the false-belief paradigm, several authors claim that deaf children with hearing parents do not develop theory of mind (ToM) until adolescence. This section provides an updated review of studies using false-belief tests published since Peterson & Siegal's (2000) review. It also reviews research using a range of methodologies investigating ToM in deaf children since 2000 and deaf adults since 1970. The results of false-belief studies provide support for a conversational account for the development of ToM, as performance appears to depend on access to a fluent signer in early childhood. Narrative methodologies show that deaf children appear to have difficulties in perspective-taking and emotional reactions, but these skills may develop later. In contrast, deaf children produce mental-states equally well as, if not better than, hearing children. Emotional recognition may also be intact but more studies are needed to clarify this. More research with deaf adults is needed. Theoretical and clinical implications are discussed.

The Development of Theory of Mind and Emotional Understanding in Deaf People: Considering Procedural Issues

Deafness

In the United Kingdom approximately 840 babies are born moderately- to profoundly-deaf[2] every year[3] (Royal National Institute for the Deaf, 2006). Causes of deafness include genetics, pre- and post-natal complications[4], head injuries and loud noise (National Deaf Children's Society, 2006), therefore additional impairments are possible. Neonatal screening-programmes for hearing-impairments[5] improve opportunities for communication development through hearing aids, cochlea implants, and importantly, adaptations in parental communication. Deaf adult populations may have been undiagnosed until a later age[6], which may have affected their development.

There are two main models of deafness; the medical model aims to reduce the disability of deafness, and the cultural model accepts deafness as a part of the person's *Deaf identity*. Deaf culture uses a distinct language; British Sign Language (BSL) has its own grammatical structure and its signs do not match each English word. For this paper, the term *deaf* will be used to include the medical condition of deafness and those who identify themselves as culturally Deaf.

Language choices depend on local provision and family preference: Children taught sign language (SL) either have classes delivered in sign or use interpreters to access mainstream education. Oral education aims to teach a child to use speech,

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[2] The level of an individual's deafness is described in decibels (dB) by the quietest sound they can hear in their best ear, or by terms of 'mild' (24-40 dB), 'moderate' (41-70 dB), 'severe' (71-95 dB) or 'profound' (>95 dB).

[3] The current population of severely- and profoundly-deaf people in the UK is around 698,000 (RNID, 2006).

[4] Pre-natal causes include rubella, cytomegalovirus, toxoplasmosis and herpes. Post-natal complications include: meningitis, measles, mumps, severe jaundice and lack of oxygen.

[5] There were suggestions of attachment issues for parents whose babies fail hearing screening 2-hours after birth, but several studies have shown that screening has no long lasting effects on parental stress (e.g. Abdala de Uzcategui & Yoshinga-Itano, 1997).

[6] Commonly, in current adult populations, deafness was not diagnosed until speech had failed to develop or they were experiencing problems at school.

residual hearing and lip-reading. *Total Communication* uses sign and speech simultaneously. In this paper those who predominantly use sign will be termed *signers* and those who predominantly use oral methods will be termed *oral*[7]. Approximately 90% of deaf children are born to hearing families with little knowledge of SL (Vaccari & Marschark, 1997). Even if a family learns to sign, they rarely achieve native fluency and tend to sign only when communicating directly with the deaf child. Deaf signers from hearing families (DH) are often referred to as *late signers* as they do not have fluent communication partners until they start school. Deaf children with Deaf parents (DD), or older Deaf siblings or grandparents, have native communication partners from birth and are as such termed *native signers.*

More than 40% of deaf children have mental-health problems compared to 25% of hearing children (Hindley, Hill, McGuigan & Kitson, 1994). There are multiple risk factors (e.g. isolation, discrimination, abuse), but if deaf children do not develop emotional understanding (or theory of mind) at the same pace as hearing children they may struggle to understand and express their own feelings.

Theory of Mind

Humans are naturally social-beings and relating well demands skills in understanding other peoples' feelings and behaviour. Many labels have been used for this understanding including *mentalising*, *mind-reading*, *social intelligence*, *empathy* and *theory of mind* (Baron-Cohen, Wheelwright, Hill, Raste & Plumb, 2001). Theory of mind (ToM) is the ability to attribute mental states, such as beliefs, intentions, memories, and desires, to oneself and others (Peterson & Siegal, 2000). False-belief tasks[8] have been labelled *litmus tests* for ToM, which children without developmental-delay usually pass around 4-years-old. Peterson & Siegal (2000) comprehensively

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[7] It is recognised that in reality deaf people may use a mixture of communication strategies
[8] False-belief tasks are described in Peterson & Siegal (2000).

review 11 studies using the false-belief paradigm to investigate ToM in deaf children, and Peterson (2004) summarises the research specific to oral deaf children. Other more general papers reflect on these reviews to discuss deaf children's development of, and the theoretical models behind, ToM (e.g. Garfield, Peterson & Perry, 2001; Harris, de Rosnay & Pons, 2005; Berndens, 2005).

Peterson & Siegal's (2000) review found that profoundly-deaf late signers perform at similar levels to autistic children, typically failing false-belief tests until 13- to 16-years-old. As with autistic children, they found the delay for late signers was specific to false belief rather than to more general false-representation. Oral deaf children's results presented more of a mixed picture depending on their residual hearing and proficiency in spoken language. Oral children's ToM may depend particularly on their language skill in the preschool and early primary periods (Garfield, Peterson & Perry, 2001). Peterson's (2004) summary showed oral children had similar delays to late signers for those with severe- to profound-deafness, whereas oral children with moderate- to severe-deafness and enough language proficiency to cope with the false-belief tests in speech, performed similarly to native signers. Native signers pass false-belief tests at the same age as hearing children (Peterson & Siegal, 2000), and are as fluent as in conversing on non-present ideas (Garfield et al., 2001). They perform better on false-belief tests than late signers even when age and nonverbal intelligence are controlled for (Garfield et al., 2001).

A 'nature or nurture' debate has surrounded ToM (e.g. Garfield et al., 2001): It was hypothesised that a central nervous system irregularity, thought to be the biological root in autism, may be responsible for the delay in ToM (Peterson & Siegal, 2000). However deaf children are a heterogeneous group with no common neurological process and so this would not explain their ToM delays (Peterson & Siegal, 2000). One theory is that neurodevelopment is altered by hearing loss, and Peterson & Siegal

(2000) cite various studies which have shown that deaf children develop different patterns of language-related brain activity depending on whether they are reared in oral or signing environments; for instance as well as the language centres in the left-hemisphere, native signers use areas of the right-hemisphere (RH) for language translation. The false-belief ability of deaf children aged 3- to 4-years is not yet known and the additional RH activation may provide more sophisticated mentalising abilities than hearing preschoolers (Peterson & Siegal, 2000).

The difference in performance on false-belief tests between late and native signers points to a "conversational explanation" (Peterson & Siegal, 2000; Harris, de Rosnay & Pons, 2005) or "socio-linguistic model" (Garfield et al., 2001). Late signers and oral deaf children have restricted access to conversation and language, in particular about mental states (Garfield et al., 2001). Hearing parents experience difficulties in discussing everyday routines with their deaf children, and find conversation about unobservable emotions and thoughts even more challenging (Peterson & Siegal, 2000). Profoundly-deaf children, restricted to the visual domain, miss out on the shared language of their family (Berndens, 2005). In their review of ToM research relating to children with autism, sensory impairments, and William's Syndrome, Garfield et al. (2001) concluded "that social and language development are each crucial to the development of ToM" (p523). Exposure to conversation rich in mental states (i.e. think, know, want, hope) promotes understanding of others (Harris et al., 2005) through lexical enrichment (increased vocabulary), syntactic enrichment (tools for embedding one thought in another), and possibly the most influential, pragmatic enrichment (exposure to various perspectives).

The Current Review

The aim of this review is to provide an updated examination of the current literature regarding the development of ToM in deaf people. Peterson & Siegal's (2000) review found evidence that deaf children from hearing families have difficulties in passing false-belief tasks and some authors have concluded that these deaf children "are genuinely delayed in their conceptualization of mental states" (Harris et al., 2005, p70). The current review aims to explore a wider range of research methodologies to investigate whether deaf children do have a delayed ToM or whether they just fail false-belief tests. Where previous reviews have focussed only on deaf children, this current review takes a life long approach to incorporate studies looking at emotional understanding in deaf adults.

Search methodology and inclusion criteria

Electronic searches were conducted on the following databases: PsychINFO, Web of Knowledge, Web of Science, OVID, PubMed and ScienceDirect. Internet searches using Google were also employed. Search terms used were: Deaf, hearing-impair(ed/ment) AND theory of mind, empathy, face/emotion(al) recognition, understanding emotion(s/al), feelings, social skills, facial affect, development, parent(ing), (sign) language, autis(m/tic), adult, child(ren), forensic, offender, violen(ce/t), sex(ual), criminal, convict(ed), prison(er), psychopath. Electronic searches were supplemented through cross-referencing from relevant papers.

A preliminary literature search revealed many studies had been published on ToM in deaf children since Peterson & Siegal's (2001) review, therefore articles were included if they were published, in English, in peer-reviewed journals between 2000 and 2006. Due to the small number of studies relating to deaf adults this date limit was extended to include studies published since 1970.

Organisation of review

Firstly an update is provided to Peterson & Siegal's (2000) review of false-belief studies. Studies using other methodologies are then reviewed, including measures of mental-state production, emotional recognition, perspective-taking, and emotional responses and reactions. Consistent with Peterson & Siegal's (2000) review, studies are summarised in tables (see Appendix-B Tables 2 to 7[9]) organised according to methodology. The review discusses implications of experimenter hearing status and language competency. Research populations are considered due to the deaf population being far from homogenous, with variances including causation, additional impairments, age of diagnosis, use of aids or implants, family hearing status, language choice and cultural allegiance.

False-Belief Tests

This first section examines studies involving false-belief tests with severely- to profoundly-deaf samples with mean ages from 4.0 to 24.5 years. Appendix-B Table 1 displays the results (organised by mean age and communication status) of the 12 recent studies alongside the results cited by Peterson & Siegal (2000) and Peterson (2004). More details of recent studies are given in Appendix-B Table 2.

Studies involving native signers have shown consistently that they perform at or above the level of hearing children, with more than 80% passing false-belief tests from 5-years-old. (Where mean-correct scores are given these also show that native signers pass more than half of the trials administered.) Jackson's (2001) study is the only exception, with pass-rates of 46-54%, but they use *native* to include deaf children whose hearing parents have a good level of BSL. However, although parents had achieved

[9] All references to Appendix within this literature review refer to the Section IV Appendix B.

Level-II BSL[10] at the time of the test (child mean age 7.1-years), they would be unlikely to have had this level of fluency from the child's birth and signing would, most likely, only be used directly with the deaf child rather than in the family milieu. Also Jackson only had Level-II herself, which is not a high enough level of fluency for accurate assessments. Peterson & Siegal (2000) noted that native signers had not been tested at ages 3- or 4-years, and it is still the case that research has not yet ascertained the youngest age at which native signers begin to pass false-belief tests.

In contrast, late signers have deficits on false-belief tests through into adulthood with most studies showing a pass rate of less than 55% (Appendix-B Table 1). Three authors (Jackson, 2001; Peterson, 2002; Morgan & Kegl, 2006) showed exceptions to this. Jackson (2001) found higher pass-rates for 6.5- and 9.2-year-old children on the changed-location (CL) test, but the sample sizes are small (n=11 & n=14 respectively) and the older group used Total Communication which may enable fuller access to emotional conversations with their families and peers. Peterson's (2002) deaf sample scored better on the CL task in an *intent* condition compared to the standardised version, and on non-verbal versions of the misleading-container (MC) task. They found no statistical significance, but this may be due to the small sample size (n=13). It may be that adapting tests and using non-verbal versions can make them more accessible for deaf signers. Morgan and Kegl (2006) are the first researchers to take false-belief testing past the mean-age of 16-years. They found that when comparing deaf 'DH' participants, there was a critical age of SL access. Those who had access to SL before 10-years-old had an average pass-rate of 91%, whereas of those who learnt later only 36% passed. However, there were only 22 participants spread across a wide age-range of 8- to 39-years. Further research would be needed to clarify the pattern post-16. Where mean-correct scores are given these also show that late signers pass less than half

[10] Level-II BSL is between GCSE and A-Level foreign language competences, and it normally takes 3 years to achieve Levels I & II.

of the trials administered. Given the general findings for deaf signers, it is not surprising that the samples where native and late signers are combined had spurious results on false-belief tests. In future, researchers need to clearly differentiate between late and native signers.

Oral deaf samples continue to display a mixed picture: Prior to 9-years-old, oral children appear to have a pass-rate of less than 55% (same as for late signers), but for studies with a mean age between 9- and 9.4-years, the pass-rates vary between 50% and 86% (Appendix-B Table 1). A key issue may be the proficiency of their spoken language, as suggested by Garfield et al. (2001), and oral deaf children may have developed enough language skills by 9-years-old to access conversations relating to false belief. Both Peterson (2004) and Moeller & Schick (2006) found no statistically significant difference in false-belief scores in children with aids or implants. As the amount of amplification can vary, larger samples giving more information about age and hearing after the fitting of aids or implants are needed to clarify whether they give benefits for false-belief understanding.

Moeller & Schick's (2006) study differs from the other studies by looking at verbal and non-verbal false-belief tests in relation to maternal language. Hearing mothers with deaf children (mean age-6.9) were videoed for one-hour in a playroom whilst engaged in play activities. Videos were coded for mental-state language and mothers had sign-vocabulary tests. The frequency of mother's mental-state talk correlated with the deaf child's performance on false-belief tests when age and language ability were controlled. Maternal sign-ability was correlated with the child's language level, false-belief scores and the amount the mother talked about mental states. The youngest hearing children scored higher than the older deaf children on verbal false-belief tests, but there were no group differences on the non-verbal false-belief test. The author claims that this was because non-verbal tests were "confusing for hearing

children" (Moeller & Schick, 2006; p757), but it should be remembered that verbal tests may be confusing for deaf children and may be testing their understanding of language rather than false belief. Moeller & Schick's (2006) study shows the importance of parent-child conversations including mental states to enable children to build social knowledge. Having more people in the family who can sign (e.g. siblings) increases the opportunities for conversational triads, which enable differing view-points and mental states to be experienced. Parents need sufficient signing skills as their limited SL also appeared to reduce what they talked about in speech (Moeller &Schick, 2006). The authors argue that it is not just the number of years of experience, but that parents greatly benefit from formal SL instruction.

Woolfe, Want & Siegal's (2003) study also differed from the main experiments as they also measured relationships with siblings in native signing families. They found that false belief was linked to positive sibling relationships, which provide extra conversational opportunities to learn about other peoples perspectives. However, these results should not be viewed as causal as limited social understanding would impact on the ability to develop positive relationships with their siblings. Further research should look at mental language in siblings and families, and examine its links with ToM.

Two of the authors of false-belief studies are known to be deaf themselves: Courtin (Courtin, 2000; Courtin & Melot, 2005) and Woolfe (Woolfe et al, 2002 & 2003). These were the only false-belief studies where the deaf signing children received instructions from an experimenter with similar language and hearing status to themselves, and it could be hypothesised that this would in itself make the children feel more at ease and impact on their ability to do the tests. However results from these studies do not appear to support this hypothesis, but as they report mean-correct they are not directly comparable to the other studies reporting percentage pass-rates.

Surprisingly, given the strength of the "conversational explanation" (Peterson & Siegal, 2000) for ToM development; only three of the studies measured verbal-ability in relation to false belief. Jackson (2001) used the BSL Receptive Skills Test (BSL-RST) for the deaf and the British Picture Vocabulary Scale (BPVS) for the hearing, and found that language ability was positively correlated with false belief; although this relationship was removed for hearing and deaf 'DD' children when age was controlled. Woolfe, Want & Siegal (2002) also found a correlation between scores on the BSL-RST and false-belief tests. When native and late signing children were matched by BSL-RST scores, native signers still outperformed late signers on false belief, suggesting intervening factors additional to language-skill. In contrast, Lundy (2002) found that false-belief skills were not related to expressive language competency or the number of cognitive signs used by the parents. Although replication of these findings is needed, it suggests that receptive competency of the child is more important than expressive skills in developing understanding of false belief.

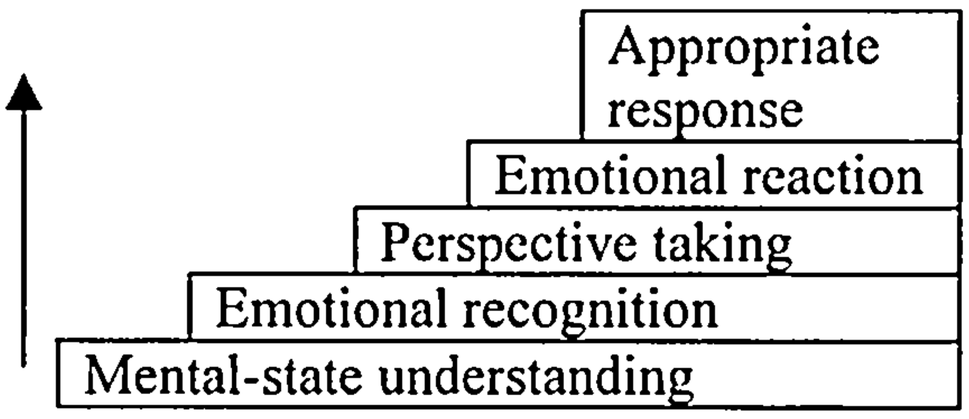
Across the studies reviewed there appears to be support for the significance of early communication and language development, as had been described in previous 'conversational' accounts (Peterson & Siegal, 2000; Harris et al., 2005; Garfield et al., 2001) for the development of false belief. Delays appear to be due to the lack of exposure to a native language, rather than due to hearing-impairments. Peterson, Wellman & Lui (2005) found that the sequence of difficulty was the same for hearing and deaf children suggesting that they follow the same developmental order, in contrast to autistic children who show a different sequence. It may be possible that learning SL helps to develop ToM, due to the perspective taking process in SL (Courtin, 2000).

The important consideration is whether standard false-belief tests are a 'litmus test' for ToM and emotional development in deaf people. False-belief tests, standardised for hearing populations, may be measuring something different in deaf people. Non-

verbal false-belief tests need to be standardised to give good validity and more research is needed to see if deaf people find these tests easier.

The literature review will now turn its focus to other methodologies to examine if they give evidence for development of ToM in deaf people. Studies have been organised according to similar methodologies and where they fit with Marshall, Hudson, Jones and Fernandez's (1995) model of empathy (see Figure 1). An additional group of studies were identified, looking at the understanding, production and classification of mental-states, which are postulated as a prior step below emotional recognition.

Figure 1. A diagrammatic representation of the four steps to empathy from Marshall et al.'s (1995) model of empathy, with the addition of mental-state understanding



Other Measures of ToM

Three studies used multiple measures examining deaf participants' performance at two or more levels of empathy. Morgan & Kegl (2006; Appendix-B Table 3) combined a false-belief task with a narrative measure scoring mental-state attributions. Dyck, Farrugia, Shochet, & Holmes-Brown (2004) and Dyck & Denver (2003; Appendix-B Table 4) used one test of emotional recognition, two measures of perspective-taking and one test of mental-state understanding. One other study used their perspective-taking narrative tasks to also measure mental-state attributions (Rhys-Jones & Ellis, 2000; see Appendix-B Table 5). These studies will be explained in more detail in the relevant sections of this review, but so as not to be repetitive, general critique is given here.

Morgan & Kegl (2006) were unique in that they sampled a wide age-range of children and adults (7- to 39-years), and they included only profoundly-deaf 'DH' signers; but their sample was small with only n=5 in the 8- to 11-years range, n=5 aged 14- to 17-years and n=12 aged 18- to 39-years. The diverse sample makes their results unreliable as results could be due to other age-related factors[11], but will hopefully set a precedent for other researchers to study a wider age-range. They also had no comparison group, so it is not known how hearing participants would perform on their measures.

Dyck et al. (2004) used a three-group design with hearing-impaired, visually-impaired and non-sensory impaired (NSI) participants drawn from the same school populations. Their hearing-impaired sample (n=49) however included varying levels of deafness from mild to profound, with a range of communication styles. Children with mild to moderate hearing-impairment would have very different language and developmental experiences to severely- to profoundly-deaf children, as they would not experience the same linguistic deprivation due to being able to make good use of spoken language. They also did not report parentage (i.e. DD/DH), and so do not distinguish which children experienced linguistic deprivation. Dyck et al. (2004) matched a subset of children according to verbal ability using the Verbal subtests of the Weschler Scales, which are not recommended for deaf populations (Psychological Corporation, 1997) as they test proficiency in the language of English which deaf persons have limited access to. It should be noted that matching by verbal ability gave groups of significantly different mean ages (deaf 14.23-years; NSI 10.30-years). Dyck and Denver (2003) used pre- and post-measures to evaluate the effectiveness of an 11-lesson program teaching emotional understanding to oral deaf children (n=14, mean age 11.84). The level of hearing with aids or implants is not stated and so it is possible that

[11] Such as age of diagnosis, schooling, further education and training.

the profoundly-deaf children did not have adequate access to the oral communication used.

Rhys-Jones & Ellis's (2000) study differs from the others as the experimenter (Rhys-Jones) was deaf and the hearing participants used an interpreter. They consider that it may have been unsettling for the hearing participants as many had not met a deaf person, or used an interpreter, before doing the tests. However this should be considered in reverse in other studies where deaf participants are at the disadvantage. Rhys-Jones & Ellis used matched deaf and hearing samples for comparison on their measures, however they included a mixture of 'DH' (n=28) and 'DD' (n=6) signing children. Given the results on false-belief studies, it would be expected that 'DD' children would perform at a higher level than 'DH' children on other tests related to ToM. Whilst they found no differences between 'DD' and 'DH' children's performance, the non-significant finding could be due to the small number of 'DD' children, but their inclusion may have added a skew to the data.

Mental States

Marschark, Green, Hindmarsh and Walker (2000) argue that too much emphasis has been placed on the false-belief task and that research should question whether deaf children understand that people have mental-states that form the basis for beliefs and actions. Mental states are defined as thoughts, beliefs and states of knowledge (Moeller & Schick, 2006) and include terms such as belief, doubt, feelings, desire, purpose, goals, knowledge, liking and thinking (Marschark et al., 2000). Seven studies (Clark, Schwanenflugel, Everhart, & Bartini, 1996; Dyck & Denver, 2003; Dyck et al., 2004; Marshark et al., 2000; Morgan & Kegl, 2006; Rhys-Jones & Ellis, 2000; Rieffe & Meerum Terwogt, 2000; summarised in Appendix-B Table 3) were identified that looked at mental-state production, understanding or classification in deaf samples.

Narrative methods were used to measure mental-state production in four of the studies covering 6- to 18-years-old, with one study taking this to 39-years-old. In contrast to false-belief studies, deaf participants (mainly severe-profound 'DH', using SL or Total Communication) were found to make more mental-state attributions than age-matched hearing samples as children (Marschark et al., 2000; Rieffe & Meerum Terwogt, 2000) and as adolescents (Rhys-Jones & Ellis, 2000), with attributions increasing with age (Rhys-Jones & Ellis, 2000; Rieffe & Meerum Terwogt, 2000) and length of access to SL (Morgan & Kegl, 2006). Rieffe & Meerum Terwogt (2000) found that age-matched deaf and hearing children both gave the expected emotion for the characters but deaf children mentioned desire more often than hearing children. This may be because communication is limited to 'wants' more than abstract feelings in hearing families with deaf children. Marschark et al. (2000) was the only author to clearly state that the transcripts of the deaf children's responses were written literally rather than in English gloss. Sign language does not directly map on to spoken English and does not have a direct written form, and so difficulties can be found when measuring counts of mental-states as either the comparison goes across two very different languages or introduces an interpreter effect[12]. Whilst the deaf participants in these studies made more mental-state attributions it is not clear if they make a wider *range* of attributions or if they are just more repetitive in their language use. Morgan & Kegl's (2006) finding that false belief was strongly related to mental-state talk may be due in part to the wide age-range sampled (7- to 39-years with over half being over 18-years-old), as access to language over time will facilitate emotional language and ToM development. It would be surprising if this correlation was replicated with deaf children

[12] For example the sign 'HAPPY HAPPY' could either count as 2 mental-state attributions if counted directly from sign, or could be interpreted as 'very happy' (as signs are sometimes repeated to give accentuation) and so only counted once.

as it is clear from the research that 'DH' children do not excel on false-belief tests, whereas these narrative studies have shown they do well on mental-state production.

Studying mental-state understanding, Dyck et al. (2004) included a test of deaf children's understanding of emotional terms and found they were no different to the NSI children, but this may be partly a result of the sample including mild- to moderately-deaf children. The children were all from the same schools, reducing the generalisability of the findings, and so may have all received similar educational around emotional understanding. Dyck and Denver (2003) found that oral deaf children had an increase in emotional vocabulary and emotional knowledge following an 11-lesson emotional-understanding program.

Clark et al. (1996) found that deaf students made distinctions[13] among mental verbs in a similar way to hearing adults. The finding of similarity may be surprising using a written questionnaire as the sample were severely- profoundly-deaf 'DH' signers who would be expected to have lower abilities of reading[14], but they may have been high-achievers. No details of the hearing sample were given and so it is not known if they were a comparable group.

Narrative methods could be critiqued for use with deaf populations, given the common finding of deaf people having lower language skills, leading to an underestimation of their ToM ability. Caution also needs to be given to the comparison of narrative tests cross-culturally and linguistically. However, as these studies have shown deaf people outperform hearing people on these tasks; it suggests good ToM abilities at this level. This finding suggests that either false-belief tasks do not adequately measure ToM in deaf populations, or that the 2 methodologies are measuring different 'theories' of mind.

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[13] i.e. *information processing* and *perceptual* or *conceptual certainty* distinctions.
[14] 95% of deaf people leave school with a reading level of age-9 or less (Stern, 2001) due to their reduced ability to use phonemic strategies.

Emotional Recognition

Three studies since 2000 (Dyck & Denver, 2003; Dyck et al., 2004; Al-Hilawani, Easterbrooks, & Marchant, 2002; see Appendix-B Table 4) investigated deaf children's emotional recognition skills. Dyck et al. (2004) found that deaf children and adolescents were significantly delayed in emotional recognition when compared to NSI children. However in the samples matched for verbal ability, there were no significant differences in scores of emotional recognition suggesting that the test explanation or material may have been too reliant on language. Following the *Funny Faces Program* (Dyck & Denver, 2003), profoundly-deaf children still had substantial deficits, but moderately- to severely-deaf children (mean 11.84-years) did not differ from younger hearing children (mean 8.77-years) on emotional recognition. However, there were only three moderately- and two severely-deaf children involved in the study and the small sample sizes would be unlikely to give significant results. It is possible that the profoundly-deaf children may have had difficulties in accessing the oral program. It is not clear which four of the children had attention deficit diagnoses (ADHD/ADD) which is likely to have impacted on their ability to access the program and tests. The validity of the Fluid Emotion Test used by Dyck et al. (2004) and Dyck & Denver (2003) is questionable as it utilises morphing between two different people's faces, sometimes of differing nationalities. The visual result is far from the reality of seeing expressions changing on a person's face. More studies need to be done using more natural stimuli.

Al-Hilawani et al. (2002) did a cross-cultural study between deaf and hearing children in the USA and UAE. They found that hearing loss did not predict impairment in ToM in either culture, but their small sample included a mixture of deaf and hard-of-hearing children; the latter having enough hearing to utilise speech and so would not have had the same levels of conversational deprivation as profoundly-deaf children. The deaf

children were also from lower socioeconomic circumstances than the hearing children in the American samples. It is the only study however to compare ToM across two cultures.

Studies of facial processing with deaf adult signers have shown that they are better at many aspects of facial processing than non-signers (e.g. Arnold & Murray, 1998; Bettger, Emmorey, McCullough & Bellugi, 1997; McCullough & Emmorey, 1997), most likely due to facial expression conveying linguistic information in SL[15]. Four studies were located that look at deaf adults' ability to recognise emotions (Schiff, 1973; Weisel, 1985; McCullough, Emmorey & Sereno, 2005; Kubota et al., 2003; Appendix-B Table 4). Schiff (1973) found that deaf students made more errors than hearing students in identifying facial expression, however the stimuli were simple circular drawings, using dots and lines in place of facial features, which are more a measure of understanding graphic notation than facial expression. No details of ages, hearing loss or general ability were given and so it is hard to generalise their findings.

Weisel's (1985) study was more realistic as they used films and photographs of deaf people making facial expressions. They found no difference in the performance of deaf and hearing participants on most emotions, except that hearing participants were more accurate at perceiving happiness and deaf participants were more accurate at identifying disgust. This is one of the few studies specifically designed for deaf participants, using deaf models for the films and photos. This should set a good example for future research as deaf people can have a disadvantage in studies where measures designed for hearing people are relied upon.

McCullough et al. (2005) found no significant difference in the accuracy of deaf and hearing participants in the recognition of emotional expression from static photographs. Using MRI scans, brain activation for hearing participants was bilateral in

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[15] For more discussion and examples see McCullough et al. (2003).

all conditions, but deaf participants had left-lateralised activation in the fusiform gyrus for emotional expressions. The shift to the left-hemisphere may be due to the decoding of linguistic facial expressions as part of SL.

Kubota et al.'s (2003) study of facial-affect recognition was the only study identified to include deaf participants with mental-illness. Deaf patients with schizophrenia performed more poorly in tests of affect-labelling than hearing patients with schizophrenia and healthy hearing controls. This apparently was not due to differences in general intelligence but no assessment is reported. The healthy controls had significantly more years of education and were also employed as medical staff, and as such do not appear a comparable group. The deaf participants were stated to have SL as their *mother tongue*, but as they do not state if participants are DH/DD and the majority of deaf people are 'DH', it is more likely they are late signers. The authors do not describe how the comprehension of the written emotional target words was assessed.

Two studies with hearing people who had learnt sign (Goldstein & Feldman,1996; Goldstein, Sexton & Feldman, 2000; see Appendix-B Table 4) suggest that learning SL, which reinforces the use of pronounced facial expressions, enhances ability to decode and encode emotional expressions. They found that signers were more accurate at identifying and conveying facial expressions. These results imply that learning SL may have the benefit of improving social competence, but the results should be treated with caution as all the signers were from the same program which could have overemphasised emotional expression. Interestingly the expression of disgust was more easily recognised by both deaf (Weisel, 1985) and hearing signers (Goldstein & Feldman, 1996). Further research should be done with deaf signing and oral participants to see if sign provides compensatory training in emotional recognition.

Perspective Taking

Six studies included perspective taking, the second level of Marshall et al.'s (1995) model of empathy, covering ages between 5- and 18-years (Dyck et al., 2004; Howley & Howe, 2004; Meerum Terwogt & Rieffe, 2004a&b; Rhys-Jones & Ellis, 2000; Rieffe, Meerum Terwogt & Smit, 2003; see Appendix-B Table 5). There were no studies with deaf adults using similar methods. Dyck et al. (2004) told stories where the character experienced an unlikely emotion and asked participants to explain why the character may feel this way. Deaf children scored lower than NSI participants; but when verbal ability was controlled,[16] this difference was removed, suggesting that this test may have been too verbally based.

Howley & Howe (2004) used a narrative measure which incorporated perspective-taking and false belief by asking participants how the central character felt and whether a late arrival had access to why the central character felt that way. They found that deaf children scored less well than age-matched hearing children on this affective-task, suggesting they were less able to judge what knowledge the late arrival would have. However, the authors' level of signing was only at BSL Level-II[17] which may have limited the children's understanding of the task and the authors' ability to accurately interpret the responses. They found that deaf and hearing children showed no difference on a perceptual task, suggesting that the deficit on the affective-task was not due to general perception difficulties. The affective deficits are surprising given that their samples included a large proportion of 'DD' children (Exp.1: n=6/10, Exp.2: n=5/25) and they included moderately-deaf children within their sample (Exp.1). It would be predicted from false-belief results that these children would score higher on all ToM

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[16] See critique in earlier section.
[17] CACDP Level-II BSL is equivalent to conversational fluency and is not adequate for accurate assessment administration.

tests and so influence the results.

Meerum Terwogt & Rieffe (2004a) and Rieffe, Meerum Terwogt & Smit (2003) used stories where a favourable event was cancelled, and found that profoundly-deaf 'DH' signers were more likely to predict a sad response concentrating mainly on the desired outcome (i.e. that they wanted to go to the event) rather than the process (i.e. what led the event to be cancelled). The two studies found different results for hearing children, with them giving balanced sad and angry responses focussing equally on outcome or process (Meerum Terwogt & Rieffe, 2004a), or predicting more anger engaging with the negative outcome (i.e. having to stay home; Rieffe et al. 2003). Meerum Terwogt & Rieffe (2004b) also found that profoundly-deaf 'DH' signers were less likely to correct the mothers' false belief, by providing additional information in order to achieve a goal, being more likely to state their desire. Rieffe and Meerum Terwogt (2004) review their studies[18] of profoundly-deaf primary school children (6- to 13-years-old) in the Netherlands. They argue that the stories used have been found suitable for 4-year-old hearing children and so assume that they would be suitable for 11-year-old deaf children; however they do not measure comprehension. They suggest that these findings may be due to deaf children's limited language skills and the powerlessness they experience in using arguments to effect processes. They cite examples from their research that deaf children were less assertive in peer conflict situations (2004b) and were less likely to explain that their feelings were hurt in order to find a solution.

Rhys-Jones & Ellis (2000) used a picture-sequencing methodology and showed that deaf adolescents (11-to 16-years-old) were able to predict feelings of characters, and

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[18] Those mentioned plus two others written in Dutch.

to empathise and make social judgements. Their results however support the delay in ToM for younger deaf children (6- to 10-years-old), arguing that deprivation in conversation leads to impaired development of mental-state awareness. As mentioned above, the hearing participants may have felt unsettled by meeting a deaf person and using an interpreter for the first time. Rhys-Jones & Ellis (2000) propose that hearing children need both visual and auditory cues, but that the deaf could make good use of the visual facial and contextual cues from pictures. If this were so, it suggests that deaf people could have qualitatively different ways of organising experiences.

Emotional Reactions and Responses

The final two stages of Marshall et al.'s (1995) model are reactions and responses. Only three recent studies, all with children, were identified in these categories (Hosie et al., 2000; Rieffe & Meerum Terwogt, 2006; Suarez, 2000; see Appendix-B Table 6). Hosie et al. (2000) told stories of characters either showing or concealing emotions of happiness, fear and anger, and asked children what they would do in a similar situation. They found that severely- to profoundly-deaf children in a Total Communication school were less likely to conceal happiness or anger, and were less likely to give reasons than hearing children. The understanding of pro-social display-rules to protect other people's feelings appear to develop more slowly in deaf children raised in the spoken environment, when compared to hearing children; however as with several other studies, their sample included a small number of 'DD' children.

Rieffe and Meerum Terwogt (2006) used peer-conflict vignettes and asked children how they would respond, how their peer may react and what would happen to their relationship. They found that profoundly-deaf 'DH' signers (10- to 12-years-old) used anger more bluntly, explained less and expected a less empathic response from their peers than hearing children. However, they were just as likely to expect the

relationship to stay intact, demonstrating less internal consistency in their judgements. Further research would be beneficial to see if these findings could be replicated. The differences may have been due to language skills despite the authors feeling the children's abilities were sufficient for the study.

Both of these studies suggest the need for emotional coaching for deaf children. Suarez (2000) found that a 20-hour program of interpersonal problem-solving and social skills improved observable problem-solving skills and increased assertive behaviour in severely-profoundly deaf children. They found it had no effect on social or academic integration but these children were all noted to have poor oral and sign abilities, which would have impacted in their capability to integrate with peers.

Discussion

This current review has drawn together the recent literature of studies measuring ToM development in deaf children and adults across a variety of methodologies. Studies measuring false belief, perspective-taking and responses or reactions have all shown that deaf children have deficits at these levels of empathy. Some of these skills may develop later but the evidence-base for adolescent and adult deaf populations is limited. However, deaf children's ability to produce mental states is intact with them performing at similar, or better, levels than hearing children. Deaf adults may organise mental states in a similar way to hearing adults, but more studies need to include adults. Emotional recognition studies suggest that this may also be intact in deaf children and adults, but deaf patients with schizophrenia may experience more deficits than similar hearing patients. There is some evidence that learning SL may improve emotional recognition and it may also lead to left-hemispheric lateralisation for facial expressions due to them also having a linguistic role.

It appears that deaf people, who do not have access to conversation about the mind as young children, do have delays or deficits in their development of ToM; fitting the 'conversational explanation' for ToM development. Studies which include mothers and siblings also add evidence towards this model. However, other than in false-belief studies, the majority of studies[19] used heterogeneous samples by including some 'DD' participants within predominantly 'DH' samples, or neglected to state parentage. This creates two problems; firstly, including 'DD' participants may skew the results but, more importantly, it does not facilitate testing of the argument that it is the deprivation of language that hampers ToM development. False-belief studies have more consistently separated native signers as a distinct group, finding that they perform at a similar level to hearing children of the same age. There are some suggestions that native signers possibly develop false-belief understanding earlier and better due to their access to a fluent shared language at home, however there has been no research with 'DD' children below 5-years-old, despite this being recommended in Peterson and Siegal's (2000) review. The one adult study to have used a 'DD' sample found deaf adults to be as accurate as hearing in emotional recognition.

Several of the studies were unclear about the predominant language of the participants and so it is difficult to make any claim as to whether deaf children's ToM differs between signing or oral populations. The studies in which deaf children are known to use sign or Total Communication show a general pattern that whilst they perform well on production of mental states, they have difficulties in all the other levels of empathy. Dyck and Denver (2003) were the only study not based on false belief to differentiate oral deaf, but with a small sample (n=14), this group of deaf children are still under-researched. Given the heterogeneous nature of the deaf community,

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[19] With the exception of three studies who had 'pure' DH samples – Clark et al., 1996; Marshark et al., 2000; Rieffe & Meerum Terwogt, 2006.

homogenous samples would be hard to achieve. None of the reviewed studies took account for the causes of deafness, and few studies considered additional impairments. More consideration needs to be given to whether narrative studies are valid when comparing groups using different language modalities. Studies have sampled deaf participants from several countries and communities giving the results a level of generalisability. There is a low representation of studies of deaf adults, only one including deaf participants with mental illness and a complete lack of research with deaf forensic and offending populations. No longitudinal research has been done to investigate the long-term impact of ToM deficits on deaf people's lives.

Clinical Implications

The current and previous reviews show that deaf 'DH' children have delays in their emotional and social development. Even when a parent learns SL, they are often not fluent and only sign *to* the child but not when talking to others around them. Not only does this isolate the child, but also denies them opportunities for incidental learning. Whilst early diagnosis of deafness and the use of hearing devices may facilitate access to language, parents of deaf children (as well as professionals working alongside them) also need to be educated on the need to converse directly with their children about mental states and to make conversations around the deaf child accessible to give them the ability to learn about different people's perspectives. In order to do this formal intervention is needed to increase parents' language skills and the number of family members who can sign (Moeller & Schick, 2006).

ToM is paramount in being able to develop meaningful relationships and to behave appropriately. Where this skill is under-developed people may struggle to form relationships (Ward, Keenan & Hudson, 2000) as they could offend or upset others by not considering their feelings. Deaf children may be more likely to act out and to

behave stubbornly (Meerum Terwogt & Rieffe, 2004a). ToM deficits could be implicated in inappropriate behaviour due to misreading people's emotions or intentions, which at an extreme may constitute interpersonal crime (e.g. sexual assault). Appropriate sexual behaviour depends on being able to accurately read cues of what the other person desires. Perspective-taking deficits could be a contributory factor in the robust finding that sexual offending is four-times higher in deaf offenders than hearing offenders (Miller & Vernon, 2003). Also a reduced ability to read other people's desires and intentions could lead to greater risk of being exploited by others. No research has yet drawn links between the apparent ToM deficits and the high rates of mental-illness within the deaf population but it could be postulated that as deaf children miss out on many opportunities to learn about emotions and feelings in others, they may also miss out on learning about their own internal state. They may also struggle to articulate their own distress in-order to receive support. When looking at mental-health and offending data it is important to remember that deaf people are more likely to have been subject to abuse, discrimination and frustrations.

Programs to develop emotional understanding could benefit deaf people in improving social skills and perspective-taking; and decreasing risks of mental-health and offending. Two studies since 2000 have shown some benefit from emotional literacy programmes for deaf children (Dyck & Denver, 2003; Suarez, 2000). Whilst it fell outside the inclusion period for this review, the PATHS (Promoting Alternative Thinking Strategies; Greenberg, Kusche & Mihalic, 1998) program delivered over one-year has shown promising results in increasing problem-solving skills, emotional recognition and social competency in deaf children and these effects were maintained at two-year follow-up (Greenberg & Kushe, 1998). Consideration needs to be given to whether all deaf children born to hearing parents should have additional support in developing ToM, as this would take considerable resources.

Conclusions

This paper has reviewed the literature on studies of ToM in deaf children since 2000 and deaf adults since 1970. Whilst this brings the literature based on false-belief tests up-to-date, further reviews are necessary to examine the full research history for each of the levels of empathy explored in this paper. This review revealed findings consistent with Peterson and Siegal's (2000) review that native deaf children perform well, and that deaf children with hearing families have difficulties, with tests at higher levels of empathy and ToM. There is limited evidence as to whether the deficits continue through adolescence and adulthood, and more studies using a variety of methodologies are necessary. The exception to the deficit is that deaf participants produce more mental states in their narratives which contradicts Harris et al.'s (2005) assertion that deaf children "are genuinely delayed in their conceptualization of mental states" (p70). It appears that deaf children and adults have no deficits in emotional recognition when realistic stimuli are used, as the studies finding deficits have had methodological flaws.

Two recommendations made by Peterson and Siegal (2000) still need further research. Papers have not included investigations of conversational and pragmatic distinctions between signed and spoken languages. Only one adult study looked at brain hemispheric activation in relation to emotional recognition. There is now a large literature-base of studies using false-belief tests with deaf children, but there are still under-researched populations. Studies still need to ascertain false belief in native signers prior to 5-years-old and in deaf populations' post-16-years. It is important also not to rely on one measure, but to develop and use testing materials appropriate for deaf participants to measure ToM at various levels. To assure good access and understanding, experimenters should have a good level of fluency or ideally should

employ deaf researchers to remove cross-cultural biases. In future, researchers need to clearly differentiate between deaf signers who have hearing parents or deaf signing parents, as well as ages of diagnosis and language access. More research needs doing with oral deaf people. There needs to be more information about participants with implants and aids, as the age of fitting and the level of functional hearing gained will impact on the amount of conversational access they can achieve, which in turn may influence their ToM development. More research is needed to look at mental language in deaf children's siblings and families, and examine its links with ToM. Exploration is needed as to whether the revealed deficits in ToM have short- or long-term implications for deaf children, and as they grow into adults, on multiple factors such as emotional-wellbeing, social relatedness, mental-health and offending behaviour. Finally, if these implications exist we need to move from theory-building into interventions to enhance ToM and improve the quality of life for deaf people.

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Section II: Research Report

Theory of Mind and Empathy in Deaf Adults in Community and Forensic Settings: an exploratory study

Abstract

Previous studies have shown that deaf children have delays in developing skills in Theory of Mind (ToM) when compared to hearing children. This study looks at whether Deaf adults have impairments in components of ToM and empathy compared to hearing adults, and also whether Deaf forensic patients have a further impairment in comparison to the Deaf community. In this study 4 Deaf forensic patients, 10 Deaf community and 11 hearing community participants were assessed on three different tests related to ToM; Reading the Mind in the Eyes (Eyes), Projective Imagination Test (PIT) and the Basic Emotion Recognition Test (BERT). All tests were adapted and translated for the purpose of the study. Results found that the Deaf community scored lower than the hearing community on the Eyes test, and produced fewer mental states in the cued total and range of the PIT and on the range of the BERT. The Deaf forensic group was too small for reliable statistical analysis, but the results appear to be in a similar range to those of the Deaf community. It is possible that Deaf people continue to have ToM impairments into adulthood, but the results may be due to many methodological, linguistic and social factors, several of which are discussed in this paper. Assessments need to be developed and tested specifically for use with Deaf populations rather than relying on interpreted measures.

Theory of Mind and Empathy in Deaf Adults in Community and Forensic Settings: an exploratory study

Theory of mind (ToM) is the ability through which one attributes mental states like beliefs, intentions, memories, and desires to self and others (Peterson & Siegal, 2000). Without this skill individuals may have difficulties forming relationships, resolving conflicts or understanding their own behaviour, as they would struggle to empathise with another person's perspective (Ward, Keenan & Hudson, 2000). Marshall, Hudson, Jones & Fernandez (1995) describe a model of empathy construed to involve four steps: The first is to be able to recognise emotions in others. The second is to consider the other person's perspective to enable understanding of their emotional state. Thirdly, the person has an appropriate emotional reaction, and fourthly they respond appropriately to the other person.

Several studies suggest that severely- and profoundly-deaf[20] children from hearing families are seriously delayed in acquiring ToM (Peterson & Siegal, 2000), however the majority of studies have used false-belief tests, which are at the second step of Marshall et al.'s (1995) model. Using narrative measures with children, late signers (signing deaf children with hearing parents) have also been found to have difficulties in perspective-taking (Howley & Howe, 2004; Meerum Terwogt & Rieffe, 2004) and in giving pro-social responses (Hosie et al., 2000; Rieffe and Meerum Terwogt, 2006). In contrast, late signers make more mental-state attributions than hearing children and adolescents of the same age (Marschark, Green, Hindmarsh & Walker, 2000; Rieffe & Meerum Terwogt, 2000; Rhys-Jones & Ellis, 2000), which goes against claims that Deaf children lack ToM. The differing results illustrate the importance of using a

[20] In this paper 'deaf' refers to the medical condition of deafness, whereas 'Deaf' refers to people who belong to the Deaf community and who use sign language.

variety of tests. Native signers (deaf children with Deaf parents fluent in sign language) perform as well as hearing children on false-belief tests (Peterson & Siegal, 1999), and it is suggested that it is the access to conversations about emotional states, not the modality, that is important in developing this skill.

Much less research has focussed on ToM in Deaf adults. Clark, Schwanenflugel, Everhart and Bartini (1996) used a written questionnaire to explore how Deaf college students organised cognitive verbs of knowing, as to whether they were alike or different based on how you would use your mind when doing that mental activity. The Deaf group showed similar organisation to hearing adults of previous research. Cognitive verbs were distinguishable by participants in terms of certainty and information-processing characteristics, as well as in categories of perceptual input, memory, constructive and non-constructive processes. It is questionable whether this methodology is appropriate for late signers, as they may have experienced linguistic deprivation[21]. Two studies have shown no difference between Deaf and hearing adults on emotional recognition tasks using photographic images (Weisel, 1985; McCullough, Emmorey & Sereno, 2005), whereas one study found Deaf students were less able to identify facial expressions than hearing students (Schiff, 1973) however this study used less realistic circular drawings. Kubota et al. (2003) found that deaf patients with schizophrenia performed more poorly in tests of affect-labelling than hearing patients with schizophrenia and healthy hearing controls.

There have been no studies to date of ToM in Deaf forensic populations and so it is not known if they follow the same pattern as hearing forensic populations. Ward et al.'s (2000) paper discusses ToM development in (hearing) sex offenders: Sex offenders have difficulties in identifying mood states, empathising with their victims, and they also struggle to establish intimate relationships. These difficulties may be a

[21] See later paragraph on testing Deaf people.

consequence of a deficit in ToM. Abu-Akel & Abushshe'leh (2004) found that violent offenders have more problems with ToM and empathy than non-violent offenders. Reduced responsiveness to the expressions of sadness and fear has been implicated in the development of psychopathy, and psychopathic inmates were particularly impaired in the recognition of fearful vocal affect (Blair et al., 2002). In contrast, Richell et al. (2003) found that psychopathic individuals did not present with any generalised impairment in ToM when compared to matched non-psychopathic individuals, and Blair et al. (1996) found that psychopaths and non-psychopaths did not differ in ToM on Happe's advanced test.

One aim of this study was to compare participants from both Deaf and hearing communities on ToM tests, including tests looking specifically at emotional recognition. Sign language includes facial expressions as a non-manual grammatical part of the language, and so fluent users of sign are well practised at reading facial expressions. The first hypothesis tested was whether Deaf and hearing adults differ in performance on tests of ToM. It may be that the delays in ToM development observed in Deaf children continue into adulthood or, alternatively, that fluency in British Sign Language (BSL) is compensatory through enhancing emotional recognition skills. The second hypothesis tested was whether Deaf forensic patients perform differently on tests of ToM than adults in the Deaf community sample. It would be hypothesised that forensic patients may have reduced skills in ToM and emotional recognition.

Testing Deaf People

British Sign Language (BSL) is a distinct language, with its own grammatical structure that differs significantly from spoken English. It is not possible to translate purely word-for-sign as BSL requires the context to be set first, is a three-dimensional

visual language and there is no written form of BSL. Therefore many tests designed for hearing people cannot be used in the standardised ways. Deaf people have often come from generally impoverished linguistic backgrounds due to having no shared language with their hearing parents in early childhood, and often not being taught a language (i.e. sign) that they can fully access until later childhood or adulthood. The majority of Deaf people leave school with a reading level of 9-years or less (Stern, 2001) due to their reduced ability to use phonemic strategies, therefore it was necessary to find tests that used a simple vocabulary and had concepts that can be easily translated into simple sign language. In this study, all measures were discussed and adapted through a Focus Group consisting of Deaf people, an experienced interpreter and Clinical Psychologists with experience of working with the Deaf to ensure the measures would be delivered to the Deaf participants in an appropriate way in BSL.

Method

Participants

In this study, sample size was limited by the expense of interpreters and the small population of Deaf forensic patients in the UK. Recruitment of participants proved to be far more difficult than hoped despite extensive attempts, and so smaller samples were achievable particularly in the Deaf forensic group.

Group 1: Deaf Forensic patients. Patients with intellectual impairment and autistic spectrum disorders, and those judged unable to give informed consent were excluded from the study. Four patients consented to being involved in the study[22], all Deaf males who communicated with BSL. Although this sample is very small, it represents approximately 10% of the UK total population in medium and high secure

[22] Some demographics are not stated due to the small sample size, as doing so may identify participants (e.g. age range).

specialist services for the Deaf. All participants were pre-lingually deaf with severe to profound hearing loss. Participants estimated their deafness was diagnosed between birth and 5-years-old. Their mean age was 39 years. Three had oral[23] educations and none of their parents signed. BSL was learnt between 11-years-old and adulthood. Three attended boarding school from mean-age 9.67-years. One achieved an NVQ and one achieved GCSEs (including English), otherwise they had no qualifications. Psychiatric diagnoses cited in their clinical files were one, or a combination, of the following diagnoses: Personality Disorder, Psychoses and Psychopathic Personality Disorder. Index offences included violent and sexual offences against adults and children. Alpha Hospitals Head of Interpreting interpreted for all the Deaf forensic participants.

Group 2: Deaf Community participants. Deaf volunteers were recruited through Deaf clubs, internet and Teletext Deaf community forums, non-clinical Deaf staff at Alpha Hospitals, and through networks in the Deaf community. People with known mental illness, learning disability, autistic spectrum disorders or criminal convictions were excluded from the study. Ten Deaf adults who preferred BSL or Sign Supported English to communicate (3 male, 7 female; mean age 39-years, range 23-55-years) participated in the study. All had severe to profound hearing loss. From participants recall; 8 were born deaf, of whom 4 were diagnosed before 6-months-old, 3 were diagnosed between 1- and 2½-years (although one did not receive hearing aids until 7-years-old) and 1 was diagnosed at 4-years; 2 participants were deaf due to meningitis between 7-10 months and were diagnosed about 2-years-old. All except one had been educated orally, although 8 participants started to learn some sign language during childhood between infancy and 7-years-old at home or socially with other Deaf

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[23] Oral education aims to teach a child to use speech, residual hearing and lip-reading. Classes are delivered in English and sign language is not used.

children outside of class-time. Two only began to learn to sign in their 20s. All had hearing parents; although one had Deaf siblings who also signed and two additional families used some sign at home. Seven attended boarding school, the earliest from 2-years-old (mean 5.43 years, range 2-11-years); the other three lived at home with their families. Only three had qualifications in English (GCSE/Level-I). Highest educational qualifications achieved were: five had degrees (including foundation degrees), three had GCSEs (or equivalent), one had NVQs and one had no qualifications. They had a mix of occupations including administration, assistant practitioners in a hospital setting, BSL tutoring, development work and unemployment. A freelance Associate Interpreter interpreted for all but one of the Deaf community sample (who used the same interpreter as the forensic group).

Group 3: Hearing Community participants. Hearing volunteers were recruited through community groups, church, internet forums and through networking. People with known mental illness, learning disability, autistic spectrum disorders or criminal convictions were excluded from the study, along with those who had studied BSL to Level-I standard or above. Eleven hearing adults (6 male, 5 female; mean age 42-years, range 25-61-years), all with English as their first language, participated in the study. None recalled any language delays or difficulties with hearing. Two were home-schooled and the others attended mainstream schools. All lived with their families, other than one who lived in care from 4-years-old and one who attended boarding school from 11-years-old. Nine had achieved qualifications in English (eight GSCE or similar, one A-level) and two had no qualifications in English. Highest educational qualifications achieved were: nine had degrees, one had a HND, and one had the '11-plus'. They had a mixed range of occupations including transport planning, education, health and social care, tree surgeon, sales and unemployment.

Design

A three-group design was used to compare the scores of participants on various ToM tests[24]. The three groups were chosen to compare participants from the Deaf and hearing communities, and those in forensic and non-forensic settings on the tests of ToM.

Power analysis

A power analysis was done to determine the necessary sample size. Results from the Adult Eyes Test (Baron-Cohen, Wheelwright, Hill, Raste & Plumb, 2001) were used to estimate the effect size, as this is the main test in this research, by comparing the means and standard deviations of autistic and control groups. The effect size was extremely large (d=1.90) when compared to Cohen's estimate of a large effect (d=0.80). These effect sizes were achieved with two groups of n=14 and n=15. For a three group ANOVA a total sample of n=27 would give a modest, but still reasonable, 0.7 power for an effect size of f=0.6. This effect size of f=0.6 is equivalent to d=1.2 (smaller than the observed effect size) and so achievable power is likely to be stronger. A two-group comparison, using two-tailed t-tests, of Deaf versus hearing community participants would require minimum unmatched samples of n=6 to achieve power of 0.8 on the Eyes test, if the effect size of d=1.9 from Baron-Cohen et al.'s (2001) sample can be trusted. It is important to consider that the Deaf forensic sample is a proportion of a small total population. At the time of proposal development, the total population in the UK's only medium secure service, for Deaf people, Alpha Hospitals, was 29, which includes patients with mental health problems and learning disabilities. The UK's only high secure specialist service for Deaf people had about 8 patients.

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[24] It is recognised that a 2x2 design would be statistically better; however this would cause many practical difficulties with being able to find matched forensic samples, and so was not realistically achievable in the time-scale for a DClinPsy thesis.

Procedure

The following brief interview and intelligence assessment were used to enable matching between groups and to facilitate appropriate conclusions to be drawn from the study.

Initial interview[25]. Information was gathered from self-report and patients files about age, gender, BSL or spoken English use, language background, education style (e.g. oral, BSL, mainstream, etc), educational achievements, and brief information on psychiatric and forensic history.

Weschler Abbreviated Scale of Intelligence or Weschler Adult Intelligence Scales – 3rd Edition (WAIS-III) Performance subtests. As general cognitive ability may affect theory of mind, an assessment of intelligence was conducted. Deafness affects language acquisition and the development of verbal skills, therefore standardised verbal intelligence measures are inappropriate for Deaf people as they assess ability and education in spoken English. Studies report that individuals with hearing impairment score at *average* or *low-average* levels on the Performance subtests, and about 1SD lower on the Verbal subtests, of the Weschler intelligence scales (Psychological Corporation, 1997; Braden, 1994). Therefore more weight should be given to the Performance subtests when assessing intelligence in Deaf people. The Weschler Abbreviated Scale of Intelligence (WASI; The Psychological Corporation, 1999) uses the Matrix Reasoning and Block Design subtests to provide an accurate estimate of Performance IQ, as they have high loadings on general ability and have exceptionally high reliability. The Performance IQ (from the WAIS-III) for the forensic patients was obtained from their files. The performance subtests from the WASI were administered to all Deaf and hearing community participants.

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[25] See Section IV Appendix A 3.1 for interview schedules.

Measures of empathy and their redevelopment for Deaf participants.

Figure 1 shows a matrix to illustrate how the following measures fit onto the model of empathy described by Marshall et al. (1995).

Figure 1. Measures mapped onto Marshall et al.'s (1995) model of empathy.

Emotional recognition	Basic emotion recognition test	Reading the Mind in the Eyes (advanced)	
Perspective taking			Projective imagination test
Emotional reaction			
Appropriate response			

Reading the Mind in the Eyes[26]. This test was developed by Baron-Cohen, Jolliffe, Mortimore and Robertson (1997), and later revised (Baron-Cohen et al., 2001), to be a more sensitive measure of adult mentalising. The test measures a person's ability to 'tune in' to another persons mental state, and as such is described as an "advanced theory of mind test". The test involves looking at a series of photographs of eyes and choosing which of four words best describes what the person is thinking or feeling. Responses are scored as correct or incorrect to give a total score.

As the foil words in the revised adults test are designed to have the same emotional valence as the target word, some BSL users from impoverished linguistic backgrounds may have found it difficult to understand the words. Therefore the test was adapted for the purpose of this research through the Focus group and a small pilot. Definitions, as given in the glossary of the original test, were presented to participants either verbally or in BSL to facilitate understanding of all the terms prior to each test

[26] See Section IV Appendix A 3.2 for exemplars from this test.

item. As BSL involves facial expressions as an essential grammatical feature, the four options were presented in BSL or English *before* each photograph and then the eyes picture shown for the person to make a choice. For Deaf participants, if options had been forgotten the signs were presented again *without* facial expression from the interpreter. Four words in the adult test could not be meaningfully translated into BSL, and so items containing those words as targets were removed, and the words substituted for a similar word where it was a foil[27]. The adapted version had 32 test items, and as a number of these had been adapted from the original version, scores were also calculated for the 25 items which were unchanged from the original test.

This measure was piloted with the first two participants of the Deaf community group. Early in the test they stated that it was unnecessary and patronising to sign each item with the full glossary definition as they were able to read. Therefore, to respect participant integrity, it was given as a choice for the participant to read the emotion words or to have them signed. Participants were strongly encouraged to request the definitions if they had any uncertainty about word meanings. Although this would mean some participants may not correctly understand, or may assign alternative meanings to, some emotion words it more respectful to participants and took less of their time to complete. The same procedure was used with hearing participants in English. As this was the only change, the pilot participants were included in the full sample.

***Projective Imagination Test*[28].** This test (described in Blackshaw, Kinderman, Hare, & Hatton, 2001) was designed as a measure of ToM by eliciting participants' conceptions of scenarios, and the characters thoughts and feelings. It involves looking at simple line-drawings of social situations and asking the participant to describe what the picture shows. It is presented in two parts; firstly *uncued* asking the participant to tell a

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[27] Target and foil words for the adapted Eyes test are shown later in Table 3.
[28] See Section IV Appendix A 3.2 for an exemplar from this test.

story about the picture, then *cued* asking them to describe what the characters may be feeling and thinking. The PIT was scored similarly to how it was described in Blackshaw et al. (2001), counting the *total* and *range* of emotions and mental states produced in *cued* and *uncued* responses. Counts were also made of the *full range* of mental states given across the items for each participant. Mental states are defined as thoughts, beliefs and states of knowledge (Moeller & Schick, 2006) and include terms such as belief, doubt, feelings, desire, purpose, goals, knowledge, liking and thinking (Marschark et al., 2000). Due to language differences and the use of interpreters, it was opted to be over-inclusive of all terms that implied an emotion or mental state. Responses were recorded verbatim for hearing participants. Interpreters were requested to 'voice' emotional signs rather than to provide an interpretation, so as to reduce interpreter effects, and these were transcribed. This test was not piloted as it was used clinically in the hospital with Deaf patients.

***Basic Emotion Recognition Test*[29].** This test is from Baron-Cohen, Wheelwright & Jolliffe (1997), and it assesses a person's ability to recognise emotions in others. It involves looking at photographs of faces and choosing which of two words describes the emotion the person is experiencing. As giving a choice of two words in BSL would involve mirroring the same facial expression as in the picture, this measure was adapted through Focus Group discussions. Pictures were presented and the participant asked "What is this person feeling or thinking?" and "Why might they feel this way? Give me an example". Using a basic content analysis (Neuendorf, 2002), responses were scored as to whether they matched the target emotion from the original test (Baron-Cohen, Wheelwright & Jolliffe, 1997). The test data also enables a comparison of emotional vocabulary using a similar method to the PIT where the *total* and *range* of emotions and mental states names were counted. Due to language differences and the use of

[29] See Section IV Appendix A 3.2 for an exemplar from this test.

interpreters, it was opted to be over-inclusive of all terms that implied an emotion or mental state. Responses, verbal or interpreted, were transcribed verbatim.

This measure was piloted with the first two participants out of each community group and as no changes to procedures were necessary they were included in the full sample.

Following the brief interview, participants completed the WASI subtests followed by the PIT and then the BERT. The Eyes test was completed last due to its presentation of a large amount of emotional vocabulary.

Results

Non-parametric tests are reported as the assumptions for parametric tests could not be adequately tested due to the low sample sizes. However group differences were also tested parametrically and in most cases the same conclusions were made, but where this is not the case, the parametric statistics are also reported[30]. It is recognised that with the small sample for the Deaf forensic group, it would be extremely unlikely to achieve significance, and so although three-group comparisons were calculated for completeness, the main emphasis of the quantitative results are on the comparisons between the two community groups.

Table 1
Mean ages and Performance IQ in each group.

	Hearing Community (n=11)	Deaf Community (n=10)	Deaf Forensic (n=4)
Mean Age (SD)	42 (12.73)	39 (9.54)	39 (8.45)
Mean Performance IQ (range, SD)	114.18 (90-129, 11.80)	104.44 (93-119, 9.31) *(NB n=9)*	98.25 (83-113, 15.43)

[30] Wherever parametric tests have been stated in this report, the Levene's test was used to check for equality of variance and the Shapiro-Wilk test was used to check for normality along with tests for skewness and kurtosis.

Comparison of groups on age and PIQ

Table 1 shows the mean ages and PIQ for each group. A Kruskal-Wallis H test indicated no statistically significant difference between the three groups on age ($\chi^2(2)=.193$, $p=.908$) or PIQ ($\chi^2(2)=5.025$, $p=.081$). As this nonsignificant effect could be due to the small group size of the Deaf forensic group ($n=4$) it was prudent to also make pair-wise comparisons. The hearing and Deaf community groups PIQ scores had a marginally statistically significant difference, with non-parametric and parametric statistics giving p values either side of the critical value of $p=.05$ (Mann Whitney U=23.50, $p=.048$; two-tailed t-test $t(18)=-2.013$, $p=.059$). Median scores show that the hearing group scored higher on the PIQ (Hearing median=112, Deaf median=101). G-power found a large effect size of $d=0.916$ and post-hoc power of .647. No significant difference was found between the Deaf groups in age (U=19.000, $p=.887$) or PIQ (U=13.500, $p=.486$), however this may be due to group size. Using visual inspection of the results, the ages of the four forensic participants were within the range of the Deaf community participants ages, whereas two of the forensic group had PIQ scores below the range of the community group (by 6 & 10 points), and two scored at the top end of the range. As there was a marginally significant difference in PIQ between the community groups, its relation to scores on other tests was investigated.

Reading the Mind in the Eyes[31]

Qualitative observations. The hearing participants, on the whole, did not request any definitions of emotion words, with the exception of a couple of participants who requested one or two definitions. The Deaf participants differed widely from those who read the English words and did not request any definitions, the majority who asked for

[31] The Eyes test was completed by all participants. Hearing n=11, Deaf Community n=10, Deaf Forensic n=4

some words to be translated into BSL, and others who needed the majority of words interpreting for them. The Deaf participants also differed widely between those who showed understanding, and prior knowledge, of the mental state once it was translated into BSL, and others for whom it was clear they were learning not only a new word but also a new emotional concept for the first time.

Table 2

Mean scores (and standard deviations) on the Reading the Mind in the Eyes Test (Eyes), Projective Imagination Test (PIT) and the Basic Emotion Recognition Test (BERT)

	Hearing Community	Deaf Community	Deaf Forensic
Eyes Test	*n=11*	*n=10*	*n=4*
All Eyes	73.22 (13.57)	53.12 (11.60)	53.91 (13.35)
Original Eyes	75.64 (13.79)	50.00 (13.76)	48.00 (14.24)
PIT (2-item)	*n=9*	*n=8*	*n=4*
Uncued total	9.33 (1.80)	6.25 (3.28)	6.00 (5.94)
Uncued range	7.89 (4.54)	5.25 (2.55)	4.75 (3.86)
Cued total	14.33 (3.54)	10.00 (3.55)	11.25 (10.53)
Cued range	11.44 (2.92)	7.25 (2.44)	9.00 (6.06)
Full range	16.22 (4.12)	10.88 (3.76)	11.75 (8.26)
BERT	*n=11*	*n=8*	*n=4*
Total	35.64 (8.50)	31.38 (8.18)	28.50 (9.57)
Range	24.73 (5.35)	19.13 (4.39)	18.25 (7.37)

Quantitative analysis. As the test had been adapted for this current research, the statistics consider the complete adapted version (*all* items), and also when adapted items are excluded, leaving only *original* items (see Table 2 for descriptive statistics). A Kruskal Wallis test comparing the three groups showed a statistically significant main effect of group on *all* 32 items ($\chi^2(2)=8.635$, $p=.013$) and on the *original* 25 items ($\chi^2(2)=13.366$, $p=.001$). Median scores show that the hearing group scored highest, followed by the forensic group then the Deaf community group (Medians: *all* H=23, F=19, DC=17; *original* H=17, =13, DC=12.5). Post-hoc approximations of effect size and power were *all*: $\eta^2=.371$, post-hoc-power=.90; *original*: $\eta^2=.467$, post-hoc

power=.98. PIQ was significantly correlated with *all* (Spearmans r=.637, p=.001) and *original* (r=.707, p<.001) items on the Eyes test. The data did not meet the assumptions for an analysis of covariance. As the three-group comparison includes the very small forensic group of n=4, pair-wise comparisons were also made. Using Mann Whitney U tests, a statistically significant difference was shown between the two community groups on *all* items (U=16.000, p=.005) and on *original* items (U=9.000, p=.001). Median scores (as above) show that the hearing group scored higher on both *all* items and *original* items. PIQ was significantly correlated with *all* (Spearmans r=.578, p=.008) and *original* (r=.672, p=.001) items on the Eyes test for the community groups, but the data did not meet the assumptions for an analysis of covariance. Post-hoc calculations found very large effect sizes (*all:* d=1.593, *original* d=1.861) and strong power (*all*: .933, *original* .981) for the community groups comparison. Comparison of the two Deaf groups, using Mann Whitney tests, revealed no significant differences (*all* items U=20.00, p=1.00; *original* items U=19.00, p=.887) which may be due to the small forensic group. Visual inspection of the results showed that, for both *all* and the *original* items, three of the forensic group scored in a similar range as the Deaf community (towards the top half) and one scored slightly lower than the Deaf community range.

Validity of the Eyes test with the Deaf population. It appeared that the Deaf participants' responses were more varied across word-choices than the hearing responses. Group responses to individual items on the Eyes test were examined more closely to evaluate the measure for use with Deaf populations. Baron-Cohen et al. (2001), in their test development, cite the 'arbitrary criteria' that "at least 50% of subjects had to select the target word and no more than 25% could select any one of the foils" (p244).

When applying this criteria to the current data set the responses for Deaf forensic and Deaf community groups have been combined as they did not differ significantly in their performance, giving a sample of n=14. Baron-Cohen et al. (2001) applied this criteria to a sample of n=225, and so this current examination of data should be treated with caution due to the small sample. With this Deaf sample using the adapted 32 item test in this research (see Table 3); 7 items failed due to >25% selecting the same foil and an additional 12 items failed both parts of the criteria.

Only 13 items passed both criteria for this Deaf sample. (It should be noted that for the current hearing sample 6 items failed on one part of the criteria and 3 failed on both parts, with only 23 items passing both criteria. Therefore the observed problems may be due to the small sample size). In many of the items, responses were spread across two or more of the available choices. Of particular interest however are two items where the majority selected one foil word with only a minority choosing the target: *item 23* (foil 'curious'=9 vs. target 'defiant' =3) and *item 31* (foil 'dispirited' =7 vs. target 'confident' =2). Although this is a small data set it suggests that many items from the Eyes Test may not be valid for Deaf subjects.

Table 3

Number of subjects in the Deaf groups (n=14) combined who chose a word on each item.

Item	Target		Foil 1		Foil 2		Foil 3	
1	*playful*	*2*	comforting	2	*irritated*	*6*	*bored*	*4*
2	upset	10	terrified	2	arrogant	0	annoyed	2
3	*desire*	*4*	joking	1	*flustered*	*5*	*convinced*	*4*
4	insisting	7	joking	0	amused	2	*relaxed*	*5*
5a	worried	13	irritated	0	insulting*	2	friendly	0
6a	*fantasising*	*5*	horrified*	3	*impatient*	*5*	alarmed	1
7	uneasy	8	apologetic	2	friendly	0	*dispirited*	*4*
8	item removed							
9	preoccupied	10	annoyed	3	hostile	1	horrified	0
10	item removed							
11	regretful	10	terrified	1	amused	0	flirtatious	3
12	*sceptical*	*5*	*indifferent*	*4*	embarrassed	2	dispirited	3
13	*anticipating*	*4*	decisive	2	*threatening*	*4*	*shy*	*4*
14	accusing	7	*irritated*	*5*	disappointed	1	depressed	1
15	*contemplative*	*6*	*flustered*	*6*	encouraging	1	amused	1
16	thoughtful	8	irritated	0	encouraging	0	*sympathetic*	*6*
17a	doubtful	11	affectionate	3	playful	0	alarmed*	0
18a	decisive	7	*amused*	*4*	horrified*	1	bored	2
19a	tentative	10	arrogant	0	grateful	2	insulting*	2
20	friendly	7	dominant	0	*guilty*	*6*	horrified	1
21	fantasizing	8	*embarrassed*	*4*	confused	2	panicked	0
22	preoccupied	10	grateful	1	insisting	3	imploring	0
23	*defiant*	*3*	contented	0	apologetic	2	*curious*	*9*
24	*pensive*	*5*	*irritated*	*4*	excited	1	*hostile*	*4*
25	item removed							
26	*hostile*	*5*	alarmed	3	*shy*	*4*	anxious	2
27	item removed							
28	*interested*	*4*	joking	1	*affectionate*	*4*	*contented*	*5*
29a	reflective	13	impatient	0	alarmed*	0	irritated	1
30	flirtatious	9	grateful	3	hostile	1	disappointed	1
31	*confident*	*2*	ashamed	2	joking	3	*dispirited*	*7*
32	serious	10	ashamed	1	bewildered	2	alarmed	1
33	concerned	11	embarrassed	0	guilty	3	fantasizing	0
34a	distrustful	8	horrified*	1	baffled	3	terrified	2
35	*nervous*	*6*	*puzzled*	*4*	insisting	2	contemplative	1
36	suspicious	11	ashamed	1	nervous	0	indecisive	2

NB: a = item includes foil word (*) adjusted from Baron-Cohen et al's (2001) test. Items failing arbitrary criteria in *italics* due to either <7 selecting the target or >3.5 selecting one foil.

Projective Imagination Test (PIT)

Not all participants[32] completed all four items of this test due to their time constraints and observations that would suggest that this test had flaws for using with these comparisons groups, and so it was reduced to a two-item test (see Table 2 for descriptive statistics).

Qualitative observations. After item one, participants appeared to understand that they would be asked for feelings and thoughts in the second part of the question and so some did not include as much emotional content in their uncued responses. Deaf participants tended to repeat parts of the question wording of 'thinking' and 'feeling' and so these two words were not included in the counts if they occurred in any participants cued responses. Overall, it was seen that the hearing participants were able to construct imaginative stories for each picture, listing a varying range of emotions. The Deaf participants were less homogenous, with some tending to give shorter stories with more description of what was in the picture rather than giving imaginative content. This was not always the case however, and some Deaf participants from both the community and forensic groups told very imaginative stories. Mental-states given in responses are included as an Appendix[33].

Quantitative analysis. As Table 4 shows, three-group Kruskal Wallis tests found significant group effects only in the *cued range*, with a small effect size of η^2=.173 and post-hoc power=.39. Median scores of the *cued range* show that the hearing group score higher (median=12.0) than either the forensic or Deaf community groups (both medians=6.5). As the insignificant differences may be due to group size, pair-wise comparisons were also made. A Mann Whitney U test comparing the community groups showed that there were significant differences in *cued total*

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[32] Therefore for the PIT, participant numbers were Hearing n=9, Deaf Community n=8, Deaf Forensic n=4.

[33] See Section IV: Appendix C 1.

(d=1.221, post-hoc power=.652), *cued range* (d=1.557, post-hoc power=.849) and *full range* (d=1.354, post-hoc power=.740). There were no significant differences in *uncued* responses between the community groups, and PIT scores were not correlated with PIQ (Table 4). No significant differences ($p>.05$) were found between Deaf groups with Mann Whitney U tests (see Table 4), which may be due to the forensic group size of n=4. From visual inspection of the data the forensic participants scored across a similar range to the Deaf community for the uncued range and uncued total. However for the cued range, cued total and the full range, three of the forensic group scored at the lower end of the range of Deaf community scores and one scored well above the Deaf community.

Table 4
Non-parametric comparison of group scores on the 2-item PIT

Comparison	Uncued total	Uncued range	Cued total	Cued range	Full range
3 groups [a]	$\chi^2(2)=2.175$, $p=.337$	$\chi^2(2)=2.35$, $p=.308$	$\chi^2(2)=5.17$, $p=.075$	**$\chi^2(2)=6.77$, $p=.034$***	$\chi^2(2)=5.92$, $p=.052$
Community groups [b]	U=22.0, $p=.174$	U=21.5, $p=.161$	**U=13.5, $p=.029$***	**U=9.00, $p=.009$***	**U=10.5, $p=.013$***
Deaf groups [b]	U=14.0, $p=.732$	U=15.5, $p=.932$	U=11.0, $p=.394$	U=15.0, $p=.863$	U=13.5, $p=.668$
Correlations of PIQ and PIT [c]	r=.086, $p=.744$	r=.138, $p=.598$	r=.104, $p=.692$	r=.267, $p=.301$	r=.265, $p=.305$

NB: [a] Kruskal Wallis test, [b] Mann Whitney U test, [c] Spearmans rho (community groups only), * Significant at $p<.05$

Basic Emotion Recognition Test (BERT)[34]

There were a wide variety of responses (ranging from 3 to 12 themes) for each face, and so it did not appear sensible to score answers as correct or incorrect as to whether they matched the targeted emotion in Baron-Cohen, Wheelwright and Joliffe's

[34] Two participants were unable to complete this test due to time constraints, therefore participant numbers were Hearing n=11, Deaf Community n=8, Deaf Forensic n=4.

(1997) original test. Instead, a basic content analysis compared target or alternative *themes* given by respondents. In order for adequate numbers for chi-squared tests to be performed on the data (using 2x2 tables comparing Deaf /hearing by Target/Alternative, shown in columns two and three of Appendix-C.2[35]) expected frequencies needed to be more than five in each box. Therefore as there were no obvious differences between the Deaf groups they have been combined into one group solely for the purpose of this content analysis, simplifying groups to Deaf (n=12) and hearing (n=11).

A chi-squared analysis comparing '*target*' or '*alternative*' responses showed that for the majority of items the variables were independent of each other (see Appendix-C.2). In three cases the chi-squared results suggest that the response depended in part on whether the respondent was Deaf or hearing (*happy 1*, $\chi^2(1)=4.439$, *surprised 2* $\chi^2(1)=4.102$ and *interested* $\chi^2(1)=5.316$, assuming $p<.05$ and a critical value of $\chi^2(1)=3.84$). However, as there are 20 significance tests, it may be expected that one or two would be significant by chance alone. If a more stringent significance level ($p<.01$) was used the critical value for significance would be $\chi^2(1)=6.63$, which would leave no significant results.

Emotional vocabulary. The *total* and *range* of emotions and mental states names were counted and averaged across the three groups (see Table 3). The Kruskal Wallis H test found no significant differences (*total*: $\chi^2=1.97$, $p=.374$; *range* $\chi^2=5.68$, $p=.058$) in means across the three groups; but as this may be due to the small n in the forensic group pair-wise comparisons were also made. Using the Mann Whitney U test, there were no significant difference in the *total* count of emotions or mental states named between the two community groups (U= 32.00, $p=.321$). However there was a significant difference in the *range* of emotions and mental states expressed (U=19.00, $p=.038$; effect size $d=1.144$, post-hoc power=.641), with the hearing community

[35] See Section IV: Appendix C 2.

expressing a larger *range* of emotions (median=27.0) than the Deaf community (median=18.0). For the community groups, PIQ was not significantly correlated with *total* (r=.338, p=.157), but was with *range* (Spearmans r=.591, p=.008) where the *range* shares 35% of its variability with PIQ (r^2=.349). However the data did not meet the assumptions for an analysis of covariance[36]. No significant differences between the two Deaf groups were found in either the *total* (U=12.0, p=.496) or *range* (U=14.5, p=.798) of emotional expressions. From visual analysis of the scores, the forensic participants scored within a similar range as the Deaf community for both the *total* and *range* of emotional states.

Discussion

If the quantitative results of the Reading the Mind in the Eyes test (which is described as an 'advanced theory of mind test' by its authors, Baron-Cohen et al., 2001) were taken in isolation, this research would confirm the first hypothesis, suggesting that Deaf people continue to have an impairment in ToM in adulthood when compared to hearing adults. Deaf people were less likely to choose the correct emotion after seeing the photos of eyes. However there was little difference shown between groups in response themes to the full face items of the BERT, suggesting that Deaf and hearing adults attribute similar emotions to facial expressions where the full face is visible. The *cued* and *full* scores of the PIT, and *cued range* of the BERT, would suggest that Deaf adults are less able to infer emotional states to a character, which contradicts findings of three studies (Marschark et al., 2000; Rieffe & Meerum Terwogt, 2000; Rhys-Jones & Ellis, 2000) where deaf children produced more mental states than hearing children. The forensic group was not large, or homogenous, enough to test the hypotheses but on the whole they scored similarly to the Deaf community group.

[36] The assumption of homogeneity of the regression coefficients was violated.

However, there were various design, methodological, cultural and linguistic factors that must be considered as Deaf participants may have scored lower on tests due to a multitude of reasons. Firstly, if the forensic group had been of sufficient size, the three-group design would have limited the interpretation of potential findings as the Deaf forensic group differed from the Deaf community group in both mental health and offending histories, of which either could have impacted on test scores. Having a hearing forensic group would have enabled the comparison of hearing status when mental illness and forensic history were matched. However, the design would have been further improved by adding a group of Deaf people with current mental illness but no offence history, as then testing could remain within language and culture. The design was also limited by comparing groups across two very different language modalities, and would have been improved by recruiting native signers instead of hearing participants[37].

The groups differed in PIQ and this was significantly correlated to scores on the Eyes test and BERT. Although assumptions were not met for an analysis of covariance (ANCOVA), it has been shown that PIQ is a predictor of ToM (e.g. Buitelaar, van der Wees, Swaab-Barneveld & van der Gaag, 1999) and so this may account for some of the differences in group scores.

Importantly the tests themselves may not be valid for use with Deaf people. As there were no available tests of ToM for the Deaf population, all tests needed adaptation and translation which is recognised as a limitation of this research, but it has highlighted issues for future test development.

The Eyes test may not be valid for Deaf people as only 13 out of 32 items met the authors' arbitrary criteria with this sample. A larger sample would be needed to determine the validity of this measure. It may be that the Eyes test was too reliant on

[37] This is discussed further in the Critical Appraisal in Section III.

language. The majority of hearing participants did not request any definitions for the emotion words, whereas the Deaf group were highly variable between requesting definitions for the majority of items or none. Hearing participants would have heard the majority of emotion words before, giving them good understanding of the vocabulary and the contexts in which the words are used. They would also use the words to label their feelings and to make sense of other peoples behaviour. In contrast for the Deaf participants, the emotions were not only from another language but also from another culture. Many of the terms were new to them and even with definitions they would not have had prior experience with the concepts. Different cultures have different ways of talking about and experiencing emotions; for instance Murphy found the sub-Saharan African people do not experience guilt as they attribute misfortune to witchcraft and Russell found the Pintupi people have 15 kinds of fear (cited in Ratner, 2000). Tests need to use concepts understandable by the culture being researched and so ideally a test would be developed using emotional concepts expressed in sign, some of which may not have an English equivalent. Some definitions in the Eyes test only gave part of the concept (e.g. *anticipating* – the definition is 'anticipating an exciting game of football' but the eyes for that target word look like they are anticipating a problem. Although the definitions had been screened by the Focus Group, some definitions and example scenarios were found to be inappropriate for use with the forensic group (i.e. a young boy getting into a man's car, a woman being followed home, a drunken man being threatening) and so it would need amending for forensic populations.

The PIT does not give guidance on what terms or statements to count as mental states, leaving it to the assessors' judgment. The adapted BERT differed significantly from the original and the adaptations may have reduced the validity of the measure. For both the PIT and BERT, responses given in BSL were given via an interpreter and as

such relied on the interpreters' lexicon of mental state terms and emotional state. Signs do not map directly onto words and, as there is a level of subjectivity, there could be variety of ways to translate the same signed statement. Results may have differed if tests had been scored directly in BSL rather than via a translation into English. Interpreter effects could have been reduced through video-recording participants and having multiple interpreters write transcripts of the responses. Also inter-rater analysis of the mental state counts and content analysis would have been desirable. Unfortunately neither procedure were feasible within the resources and time-scales of this project, and so the data should be treated with caution.

The Focus Group[38] noted that Deaf people rely on animated three-dimensional images and so may find it more difficult to be creative from the flat minimalist graphics of the PIT as it does not provide a hook for cohesive discourse. They questioned whether the differences would still be apparent if more animated stimuli were used for both the PIT and BERT. Also, the way in which pictures are described differs in BSL and English, with contextual information being given first. These linguistic difficulties warrant this testing method unreliable for cross-cultural and cross-lingual research and therefore can only give general points of interest rather than full conclusions.

There may be other reasons why the Deaf participants did not do well on these tests other than ToM. Several Deaf participants said they would find the Eyes test easier if it included the mouth. It was discussed whether Deaf people found it harder to recognise emotions from only the eyes as they may focus more on lips in communication using lip-reading. The Focus Group did not think that this would be a factor as Deaf people tend to have both eyes and mouth within their visual range. It may

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[38] Focus Group members gave feedback on the conclusions through meetings and correspondence (members: Clinical Psychologist and Neuro-psychologist both experienced in working with Deaf clients, Head of Interpreting at Alpha, Deaf Assistant Psychologist, Deaf communication facilitator).

be interesting to study recognition of emotions from different face parts between different populations. The PIT asks participants to tell stories. It is possible that Deaf children may not have had as many imaginative stories told to them as children, with communication being limited, and would have had less access to creative film and media. The BERT used full face photographs, however these are assumed to be of a hearing person. Hearing people are likely to be habituated to inferring emotional state from subtle facial expressions alongside audible clues. Whereas, in contrast, Deaf signers use pronounced facial expression as a part of sign language (Goldstein, Sexton & Feldman, 2000), and so tend to be more animated when communicating their feelings to others in the absence of sound. Deaf people may produce different natural facial expressions compared to hearing, and this could be an area for further research. Previous research with hearing signers found they were more accurate at conveying emotional expressions than hearing non-signers (Goldstein, Sexton & Feldman, 2000). A meta-analysis of 97 studies showed that people were generally better at recognising emotions from people within their own cultural group (Elfenbein & Ambady, 2003), and the same may apply with Deaf populations.

Across all of the tests, it must be remembered that in addition to audiological and cultural status; the participants differed in upbringing and language qualifications, both between and within groups. Although most of the Deaf community participants were born deaf, time of diagnosis varied between early infancy and age 4-years. Before diagnosis families would have made no adaptations to the child not being able to hear and they will likely have missed out on many opportunities for incidental learning. As children, most of the hearing participants lived at home with their families, whereas many of the Deaf participants attended boarding school from as early as 2-years-old, and whether this had implications on their ToM development is not clear. With neonatal

screening and local education provision being more commonplace now, along with improved hearing devices, today's deaf children may develop differently. Most hearing participants had qualifications in their native language of English, whereas only a minority of Deaf participants had any qualifications in English despite most of them being taught orally and only a few had qualifications in BSL.

Generally the Deaf population is not at all homogenous as a group; for example there are variations in linguistic background with some native signers fluent in BSL, some fluent bilingually in English and BSL, some more reliant on lip-reading and limited BSL, and others with late language development and limited fluency in either language. There will also be variances in internal language, in other words how the person thinks. This makes it difficult, if not impossible, for standardised protocols for delivering tests to Deaf people. Theory building is needed to produce ecologically valid tests developed specifically for the Deaf populations' visuo-spatial language rather than relying too heavily on translated tests.

Conclusions

Although some of the results point to the possibility of Deaf adults having impairments in ToM at the first two levels of Marshall et al.'s (1995) model of empathy, there are a number of alternative explanations for the results. However, if the delays in ToM development shown in many studies of Deaf children continue into adulthood this may be for a variety of reasons which have educational, clinical and forensic implications. Deaf adults who are late signers have access as adults to conversation with native signers and interpreters with good emotional knowledge. This however does not appear to have enabled them to 'catch up' with hearing people on tests of ToM. It may be that there is a critical period for the development of ToM.

If Deaf people have lower levels of emotional vocabulary this may be improved through programmes in schools and services. Parents and teachers should be encouraged to discuss feelings with their Deaf children. Lack of an emotional vocabulary and ToM could add to distress for a Deaf person if they are unable to label and express how they feel, which could precipitate or accentuate mental health problems. In accessing therapy, Deaf people may need psycho-education about emotions and mental states before therapeutic work can be meaningful to them. Impairment in ToM could be a factor in anti-social and inappropriate behaviours. Some research suggests that there are higher proportions of sexual or violent offences in Deaf prison and forensic populations (Young, Monteiro & Ridgeway, 2000), and this may be due to reduced mind-reading abilities and the ability to receive social feedback about their behaviour. This places responsibilities in services to develop reliable ways of assessing and increasing ToM in order to reduce the likelihood of initial and further offences. Community psychology and mental health promotion teams should also ensure mental health promotion and problem prevention messages are accessible for Deaf people. Whilst BSL was officially recognised in 2001 as a language of the UK, there is still a lot to be done in providing equal access to information and services.

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Section III: Critical Appraisal

Critical Appraisal

This section provides a commentary of the research process from my perspective as the researcher, including personal reflections on the project and its key learning points. It describes the origins of the study, and explores the various challenges faced during the progression through my doctoral thesis, and of researching within the Deaf culture. Methodological problems, clinical implications and areas for further research are discussed. This thesis marks the ending to my clinical training and the beginning of what I hope to be an exciting career, seeking to play my part in improving the psychological well-being of Deaf people and their access to psychological services. In this paper 'Deaf' refers to who those who belong to the Deaf culture and use sign language; whereas 'deaf' will refer to oral populations and also to those whose cultural and linguistic status is either unknown or mixed.

Origins of the Project

The true origin was Dolores, hence the dedication of this thesis to her. Whilst working at a college for the blind in my gap year I was asked to support Dolores, an Irish deaf-blind young woman, to learn British Sign Language (BSL). Her visual impairment was such that she could not see across the room and I needed to copy signs directly in front of her. During my degree I worked for Sense providing care for deaf-blind children and adults and passed BSL Levels I and II. Through Deaf colleagues at Sense, I gained the privilege of becoming involved in the social and political aspects of the Deaf culture.

I joined the national Special Interest Group for Deafness and Psychology in 2001. Deaf people are restricted to a small number of national services as few psychologists can sign. Alternatively they can use interpreters in local services where

clinicians may not have awareness of Deaf culture and developmental issues. It is relatively rare for psychological research to include Deaf participants, leaving gaps at theory-building levels.

Therefore on entering clinical training I was determined to research with Deaf populations. I was surprised when a clinical psychologist (Carolyn Lovelock) from Mayflower Hospitals (now Alpha Hospitals) attended the Clinical Psychology Unit's (CPU) Research and Placement Fair offering specialist placements in their private-sector forensic services, including a Deaf medium-secure service in Manchester. Carolyn put me in touch with Sue O'Rourke who was the Head of Psychology for the Deaf service and Sue offered the opportunity to link my research to a placement.

I explored various options for projects in Deafness with Sue, but the difficulty was considering how issues could be measured in the timescale, as tests would need creating or adapting due to the linguistic and cultural differences of the Deaf population. The choice of area was narrowed down to Theory of Mind (ToM) as Sue had observed clinically that Deaf people in forensic settings commonly don't have good ToM. Deafness was not within any of the academic supervisors' core interests but Nigel Beail offered to supervise the project. He had recently supervised Sue's post-qualification research and so had some understanding of research with Deaf populations.

Development of the Research Proposal

A preliminary literature search found a large evidence-base for deaf children but only one study of ToM in Deaf adults. Michael Siegal, who has published many papers on ToM in deaf children, gave me a useful synopsis of the research and pointed me towards relevant publications. I met with Sue and Alun Thomas, a clinical neuro-psychologist experienced with Deaf populations, to look at measures that could be

adapted. We had to discard several tests due to linguistic, cultural and experiential reasons (e.g. tests based on telephone conversations). We identified a group of tests that appeared possible to adapt, of which Reading the Mind in the Eyes (Eyes; Baron-Cohen, Wheelwright, Hill, Raste & Plumb, 2001) would be the main test. Power calculations predicted that I would need three groups of 15 participants in each, which Sue was fairly confident would be possible to recruit.

Researching in a Host-Community

As the research was to be conducted in the Deaf community, cross-cultural ethics needed consideration and it was important to involve Deaf people in reviewing the measures for their applicability with Deaf populations. The information sheets and consent forms needed to be translated into an accessible form of written English and also presented in BSL.

As BSL Level-II is not a high-enough level of fluency for accurate assessments it was necessary to use interpreters. Alpha Hospitals agreed to support my project in return for me providing clinical input through being on placement. This enabled me to use staff in my focus group and the interpreting service for patient and staff participants. However, the cost of interpreting for the community participants put my budget above the maximum grant of £500 from the CPU.

Gaining Approvals

The initial proposal was developed within 6-weeks as the CPU brought forward deadlines for our year-group. Given the speed of going through a complex cross-cultural process I was unsurprised when, following scientific review in January 2005, multiple changes and adaptations were required. I met with my supervisors on several occasions

and held a focus-group meeting to look at measures and consent processes. Difficulties with my health and course-work pressures delayed the proposal resubmission until June 2005. The Sheffield Health & Social Research Consortium (SHSRC) granted funding of £250 in July 2005. Following minor amendments, approval was given by the Research Sub-Committee in August 2005. Research governance from Alpha Hospitals was approved in November 2005. In December 2005 I attended the Ethics Committee who, following minor amendments, granted ethical approval in February 2006. Research governance from SHSRC was also received in February 2006.

I found it a struggle to maintain enthusiasm through the seemingly endless amounts of paperwork and administration to get the necessary approvals. Receiving the final approvals gave a boost to my motivation, as similarly to clinical work, data collection involved interacting with people.

Contracting Interpreters

The Head of Interpreting at Alpha, Claire Shard, was keen to be involved and agreed to do all the interpreting for forensic and staff participants. Claire advised me on formally contracting the community interpreter as I had not employed someone before. I contracted Anna Williams, Freelance Interpreter, as she also had a psychology degree. A meeting for the interpreters was arranged, to agree how they would interpret the tests, but unfortunately it fell-through and was not possible to rearrange as participants were already booked. As it is preferable for communication to be direct rather than indirect, I planned to use Anna as 'interpreter as researcher' for the community participants, as she could deliver the tests with training and observed practice - I hoped this would enable the budget and my time to spread further as she could gather data more locally to her base. However, with recruitment difficulties and pressures on Claire's time, Anna

interpreted for Deaf staff at Alpha, which also served to protect their professional/personal boundaries.

Adaptation of Measures for Deaf Populations

Several meetings were held with the focus group and individual members to look at adapting the measures. The Eyes test (Baron-Cohen et al., 2001) took several discussions. We originally chose the child version as the emotional terms were likely to be known by Deaf people but later decided definitions should be available and, as the adult version had a glossary, we opted to adapt that version. Many discussions were around the presentation of emotion words and definitions (e.g. videos, line-drawings and print). The final decision was to present everything through the interpreters, because of variations in regional signs and individuals' language-ability and education. The other tests appeared more straight-forward to adapt as less language was involved in their presentation.

The Challenges of Recruiting Cross-Culturally

Recruitment began in February 2006. Whilst recruiting hearing participants brought minor challenges, there were substantial problems recruiting for the Deaf Forensic and Community groups.

After the project had been agreed and had gone through the University and Alpha approval processes, Sue gave notice to Alpha Hospitals. I met with both her and my university supervisor as I felt I should redesign my project, for fears of facing difficulties with Sue not present. Both of them encouraged me to continue with the project as it stood. Sue continued to give invaluable support and supervision on the project, and guided me to which patients may be able to consent and which staff to

approach, but without her presence it felt difficult negotiating for interpreting and access to staff, when all had resource implications for the hospital.

Deaf Forensic

Working in the forensic environment was professionally and personally challenging. Having just finished working with child victims of sexual-assault I found it difficult to empathise with patients with sexual offences against children. Due to my own stress-levels, Sue leaving and the strains of commuting to Manchester, I reduced my placement to 6-months instead of the planned year-long placement. I was concerned whether Alpha Hospitals would still support my project and if it was still feasible.

It had been estimated that I would be able to recruit 15 patients for my research. However despite multiple visits to wards, presentations to patients, and key-workers asking on my behalf, only 5 patients showed interest; one of whom dropped out during consent. Other patients were either not interested in taking part or too unwell to approach. My gut feeling early on had been to reduce to a two-group design of community samples. However, as a couple of forensic patients had already taken part and my supervisors had encouraged me to persist, I continued. In hindsight, I wish I had followed my gut-feelings, as sticking with the project as-was cost me months of attempted recruitment, only to end up with too small a sample of forensic patients for any reasonable analysis.

I had considered widening recruitment to include high-secure patients but through discussion with my supervisors, I decided not to attempt to recruit from Rampton due to time-constraints as further ethical approval would have been necessary, as well as a week-long compulsory induction to access the 8 Deaf patients there. To

gain sufficient numbers of low-secure inpatients it would have been necessary to recruit nationally, which went beyond the feasibility and timescale of the project.

Deaf Community

I had hoped to access participants through Birmingham's Deaf community but that Deaf Club was being rebuilt at the time of my research. Being a hearing researcher unknown to a Deaf community was difficult. One Deaf Club had recently supported several projects and were not keen to support mine. Another felt the participation time of 60- to 90-minutes was too long unpaid, as they recently had a researcher paying £20 for 10-minutes. A third Club agreed I could recruit there, but the only volunteers did not fit inclusion criteria as they were deafened as adults. A number of Deaf exhibitors at a Deaf Awareness event in March 2006 showed interest but, as some did not fit inclusion criteria and others were unable to commit, I only recruited 2 participants from that event.

I advertised for participants on various Deaf internet sites and Teletext Read-Hear pages. Only one participant came via this route, despite one online-advert being viewed by 953 people by May 2006. No interest was gained through posters in local colleges with Deaf students or at a Deaf information-point. Recruitment of staff from Alpha also posed challenges. Just 2 Deaf staff responded to posters to find out more; only one agreeing to take part.

An Ethics requirement, to give people time to consider involvement in my study, went against me when liaising with the Deaf community. Firstly it had cost and organisational implications requiring separate occasions for interpreting for recruitment and participation. Some people said they would take part there-and-then but would not commit to coming back another time. Given the nature of the tests, it seemed excessive

for a week-long gap between recruitment and consent for the community participants; and several said so.

By May 2006 I only had 4 Deaf community participants and my health problems were hindering my progress further. It was apparent I would not be able to complete for the usual deadline of July 2006 and I had to apply for an extension. The extension was granted to January 2007. I met with both supervisors to explore how to improve my sample size. We discussed changing the inclusion criteria for community samples or including forensic patients in both Deaf and hearing groups. We also discussed sourcing additional funding to pay participants. As the necessary approvals would add delays, I chose first to seek advice from Adrian Simpson, the department's statistician. The original power calculation was based on Cohen's estimate of a large effect, however the post-hoc power calculation from the Eyes test had given exceptionally larger effect sizes. Using values closer to the post-hoc calculation suggested I could achieve reasonable power from 6 to 10 participants per group.

I decided to have another attempt to recruit Deaf staff at Alpha. I introduced myself to as many Deaf staff as possible, explaining in person what I wanted to do. I managed to get several volunteers this way but I was not able to make contact with all of their line-managers to agree their taking part during working-hours. As I was no longer working at Alpha I commuted on my weekly study-day specifically to recruit and see participants. This took several weeks as, on multiple occasions, patients were not well-enough and staff had double-booked themselves or were needed on a ward. This was frustrating as not only had I made a 100-mile round trip but I still needed to pay for my community interpreters' time and travel.

Meeting Other Researchers in Deafness

I was fortunate to achieve funding to attend the World Congress of Deafness and Mental Health in South Africa in October 2005. This was a fantastic experience to meet other researchers and clinicians from around the world. It helped me to think through the clinical implications of my own research.

At the Deaf Awareness event in March 2006 I met other researchers from the Sheffield University Psychology Department (SUPD). They were recruiting Deaf participants, and with more substantial funding, were paying people to take part. This helped me to understand why I was having so many difficulties finding participants locally as we were recruiting from the same populations, which unfortunately had not been picked up by ethics or governance. It was good to meet other researchers with interest in Deafness and when I told them about my study they mentioned that Olivier Pascalis (from SUPD) had interest in deafness and facial recognition. Whilst this was good to find out I was disappointed I had not been aware of him earlier and it highlighted a need for better communication between the CPU and the main department. I met Olivier in March 2006 and discovered he had developed computer-based tests in emotional recognition for Deaf people which, if I had met him earlier, may have saved me a lot of time. Olivier was very helpful in providing me access to a number of publications relevant to my literature review, as was Michael Siegal.

Analysis of Data

In August 2006, in consultation with Nigel, I decided to end recruitment and begin analysis of the data. It was disappointing to be only beginning the analysis when my peers were preparing for their vivas. However, moving to the analysis stage gave me a new boost of motivation as the end was closer in sight.

I consulted with Nigel and Adrian how best to include the forensic results. I had to be careful not to report individuals' results as this may identify them to staff. The final decision was to report three-group statistics with explicit cautions attached, and also to run pair-wise comparisons on the community groups.

The Projective Imagination Test (PIT; Blackshaw, Kinderman, Hare & Hatton, 2001) and the Basic Emotion Recognition Test (BERT; adapted from Baron-Cohen, Wheelwright & Joliffe, 1997) had narrative responses to converted into quantitative data. There was huge variance given in responses to the pictures of the BERT, and calculating total correct according to the target emotions from the original test did not appear appropriate, therefore a basic content analysis was used. My year-group had by this time finished the course and none of my peers were available for providing inter-rater analyses.

Given the multiple tests, a substantial amount of data was generated. I found the analysis challenging but enjoyable, although it tested my understanding of statistics and SPSS. Adrian Simpson's advice was invaluable throughout this time.

Drawing Conclusions

To ensure I was considering all the issues of language and experience of Deaf people I arranged a focus group to discuss my findings. Unfortunately, terrible road conditions meant that I met with less people than had been planned, and so I backed up this meeting with correspondence with focus-group members. Discussions with the Deaf assistant psychologist were particularly helpful due to her experience in both Deafness and psychology.

Writing Up and Maintaining Motivation

The writing up process took a couple of months as in October 2006 I started a locum post whilst writing in the evenings and weekends. I had to face the reality of carrying a similar work-load as if I had fully qualified whilst only being paid and titled as a trainee, but fortunately I thoroughly enjoy my job. It is disheartening that, in the current climate of NHS cost savings, there are few jobs available after so many years of pursuing qualification. I therefore placed my determinism to work with Deaf populations as my key motivating-factor in completing the thesis.

Whilst I had read all of the literature earlier in the year, drawing an outline for the literature review, I had delayed the final writing-up of it as the recruitment and analysis were so time intensive. In hindsight, the writing process provided a more thorough understanding of previous studies and their limitations which, had it have been written earlier, would have benefited me in the development of the project.

A written summary of the findings of this research will be sent to all the participants. As literacy cannot be assumed, in my Deaf samples, a DVD of the feedback information will be produced in BSL.

Methodological Limitations of the Research Study

None of the adapted measures were standardised, however this is true for all assessments of the Deaf. Most tests bring difficulties with language or culture and results have to be considered carefully as to why Deaf people may not score well. The Eyes test was limited by the emotional language it required, and the photographs in the Eyes and BERT were assumedly of hearing people. I discussed these critiques further in the research report.

The adapted BERT only had similarity with the original in terms of the photographic stimuli used, and so was in-essence a new test. My use of this test was more alike a pilot, as only through using it with multiple participants did the scoring problems become clear. Inherent in test development there will always be some tests that have problems on piloting.

Whilst the PIT had been used clinically, it had not been used as a research tool with Deaf populations. One major flaw of the PIT and BERT was due to comparing responses verbatim in English versus transcripts of the interpretation of BSL into English, which introduced interpreter effects, and gave a comparison of two languages, for which I have critiqued other studies. This had not come to our attention until the time of analysis. Not having inter-rater agreement brings flaws to the study and the results should be interpreted with caution. However, the caution would remain even if there was good inter-rater agreement due to the differences in language and culture. The methodology would have been improved through videoing the participants' responses to ensure consistency in the translations and transcriptions.

Having used measures adapted from English, it would have been preferable to include measures of language-skill and emotional vocabulary. However the issues raised demonstrate the need for tests to be developed for Deaf people. As native signers have been found to have good false belief it would be better to compare native (or fluent hearing signers) and late signers in sign language, rather than comparing across two very different languages. Also, using Deaf people or interpreters as experimenters and keeping the data recorded in BSL would remove translation effects.

The small sample sizes also bring limitations to the study, which have been discussed throughout the report and this critique. The forensic sample was too small for quantitative analysis. Given that more than half of the Deaf community sample were

staff at the forensic hospital it could have been hypothesised that they would err towards being more empathic than the general population. However the results did not fit with that hypothesis, but that could be related to the methodological problems rather than ToM. Whilst achieving a community sample that only included Deaf adults with hearing parents, there were other differences as one had Deaf siblings, a few used some sign language at home and one was educated in BSL and it is not known what impact these have on the ToM of Deaf adults.

Clinical Implications

What the literature review and research study suggest

Clinical implications have been discussed in the literature review and research report. In summary, it appears that the ToM deficits observed in deaf children may continue into adulthood. Where ToM is under-developed it may impact on relationships and behaviour. Difficulties in empathy and mind-reading are implicated in violent and sexual offending. Difficulties with the understanding of emotions may lead to distress and difficulties in communicating that distress in order to gain support.

Areas for intervention could include educating parents of deaf children of the need to converse about feelings and to facilitate opportunities for them to 'eavesdrop' on other people's perspectives. Whilst schools are educating children about personal and social development, this needs to be further emphasized for deaf children. When mental-health promotion messages are given to the general community, it is important to ensure access for Deaf people.

Clinicians working with Deaf clients need to consider their level of emotional understanding and provide psycho-education where needed. From Sue's clinical experience, some Deaf clients have not known the meaning of, or distinctions between,

terms such as 'thought' or 'feeling'. Ways need to be developed to meaningfully assess ToM in Deaf clients in clinical settings.

Whilst not directly linked to the topic of ToM, I observed in my Deaf community sample that those who had access to some sign language in childhood, either at home or school, were the ones who had achieved the highest qualifications as adults. The majority of the Deaf adults were educated orally as children, yet 10/14 had no qualifications in English and all chose to use sign language as adults. This brings to question which form of language is best for deaf children to be educated in, both for educational achievement and psychological development.

What I have put into practice

Whilst at the World Congress I heard of programs being run in other countries to promote emotional well-being of deaf children. On my return the supervisor of my child community psychology placement encouraged me to run a project with deaf children in Sheffield. This created various opportunities to forge links between my research and clinical practice. Through meeting with various professionals working with deaf children I was able to highlight the need to facilitate conversation about emotions with deaf children. I delivered mental-health training to the audiology service, a part of which enabled me to disseminate my learning from the research and literature, and I have arranged to do similar training for the Deaf education service. I designed and delivered two week-long emotional literacy programs with a Teacher of the Deaf for primary-school children in an oral unit. Her observations that the children struggle to understand other people's perspectives and their own feelings fit with the findings of the literature review. A simple measure showed the children's emotional vocabulary improved following the program, and they were observed to improve understanding of

their own and others feelings. I will be running a workshop for parents of deaf children, which will highlight the importance of having conversations about feelings, and learning about other peoples' perspectives, for their children.

Further Research

There are many gaps in research with Deaf populations, some of which were discussed in the literature review and report. Given the difficulties I faced in methodology and recruitment there is little surprise that so few studies are published. Further research proposals need to be developed closely with, and preferably led by, Deaf people. Researchers need additional resources when researching with this population. Financial payments for participants may aide recruitment in small populations. Research needs to explore the best way to compare groups of differing language modalities and tests need to be developed, and standardised, specifically for use in sign language. It may be that qualitative methodologies are needed in order to theory-build emotional understanding in Deaf adults.

A Deaf version of the Eyes test could be developed (i.e. with Deaf models and emotional concepts from BSL) and compared to the translated version to explore if they give similar results. This could then lead to standardisation of an Eyes test to facilitate its use as a clinical tool. The original Eyes test is now available as an online test[39] and a version could be developed with the words given in BSL.

There needs to be further studies of emotional recognition using both Deaf and hearing models. There is a gap in research using the false-belief paradigm with native signers under 5-years-old and with Deaf people over the age of 16-years. Longitudinal studies would enable better understanding of whether the false-belief deficits observed continue into adulthood and what implications they have for Deaf people.

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[39] E.g. http://www.questionwriter.com/samples/eyesquiz/

Future research needs to carefully consider which populations to compare. As previously discussed, comparing late signers with native signers or fluent hearing signers would enable comparisons to be made within-language. It would also be interesting to have comparative studies of Deaf signing adults who were educated orally versus those educated through sign language or Total Communication.

Key Learning Points

This project has given good preparation for the multiple roles of a clinical psychologist. As it was only my second experience of a research project it has been fundamental in developing my research skills. Many of the problems and delays I experienced would have been helped by a better understanding of the research process. Several of the learning points from my research are directly applicable to clinical practice.

Had I have chosen a project within the core interests of an academic supervisor they may have been more clear, from the beginning, of how much was involved and been able to provide more guidance. Instead my enthusiasm led to an over-ambitious project, teaching me the importance of balancing interest with work-load, time-scales and availability of supervision in order to have achievable goals, especially in areas where I have less experience. A number of colleagues commented that they had thought the project was over-ambitious and more suitable to the time-scale and resources of a PhD, rather than a DClinPsy, a comment which even my academic supervisor made towards the end of the project. It would have been more satisfying to have successfully adapted and piloted one measure, rather than having three measures with problems remaining. Many of the times I questioned the feasibility of the project, I was encouraged to continue. Questioning more, and checking out with previous trainees and

more psychologists who had researched with adult Deaf populations, would have been beneficial. I have learnt that I should trust my own gut-instincts and judgements more, and be assertive in making decisions, rather than running with other people's estimations of what is possible for me to achieve. This will be important in the transition from *trainee* to *qualified* as I take on further responsibility for managing my own workload whilst becoming more exposed to service pressures and needs. Also I have found that I need to be more assertive and proactive in requesting support and feedback from supervisors, and to seek out information rather than assuming it will be provided (e.g. discovering researchers in Deafness in the SUPD). As the project took 6-months more than had been anticipated, my levels of motivation fluctuated and the engagement of others was more challenging to maintain. Having learnt that I am most productive when there are clear deadlines in place, or there are defined objectives to fulfil, I will ensure I put them in place to facilitate pacing my workload and sustaining motivation.

In future research I would write a thorough literature review *before* commencing on proposal development. As I am likely to be involved in further research with Deaf populations, I will encourage deeper involvement from those within the culture from the very beginning of proposal development. I have discovered the pressures of running a research project alone, albeit with advice from supervisors, and would want to work within a team for future research.

Having experienced first-hand the cyclical nature of research and practise, I will continue to use published literature to provide an evidence-base for my practice. I have also furthered my knowledge of working within the Deaf culture, using interpreters (previously always signing for myself) and test development. I have discovered through this work that forensic is not an area in which I feel naturally suited and this has enabled

me to direct my career. I am keen to do more to promote the emotional development of d/Deaf[40] people, and aim to specialise with d/Deaf children as my career progresses.

Reaching the end of this critical appraisal signifies the personal achievement I have made by completing my research and my clinical training. Despite it being a thoroughly challenging piece of work, full of struggles and delays, I have learnt a lot and hope it will positively impact on my future, both professionally and personally.

[40] d/Deaf is a commonly used term that acknowledges d/Deaf people may or may not associate themselves with the Deaf community and it's language.

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Section IV: Appendices

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1. Format

    1.1 Letter of Approval for Specified Journals

    1.2 Notes for Contributors

1.1 Letter of Approval for Specified Journals

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30 January 2006

Sylvia Glenn
Third year trainee
Clinical Psychology Unit
University of Sheffield

Dear Sylvia

I am writing to indicate our approval of the journal(s) you have nominated for publishing work contained in your research thesis.

Literature Review: The British Journal of Developmental Psychology

Research Report: The Journal of Deaf Studies and Deaf Education

Please ensure that you bind this letter and copies of the relevant Instructions to Authors into an appendix in your thesis.

Yours sincerely

Andrew Thompson
Chair, Research Sub-Committee

1.2 Notes for Contributors

Notes for Contributors

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Email response to query about word limits and style requirements:

No word limits...we look for quality, and quantity is secondary.

References should be APA style (OUP removed it from the website, but it'll return). Look at any issue for examples.

Thanks.

M.

****
Marc Marschark, Ph.D., Editor
Journal of Deaf Studies and Deaf Education
National Technical Institute for the Deaf
96 Lomb Memorial Drive
Rochester, New York 14623
Fax: (+01) 585-475-6580
and
School of Psychology
University of Aberdeen
Aberdeen AB24 2UB
Scotland
United Kingdom

2. Ethical approvals

2.1 Copies of letters of approval from the ethics committee

2.1 Copies of letters of approval from the ethics committee

Wrightington, Wigan & Leigh Local Research Ethics Committee
Room 181, Gateway House
Piccadilly South
Manchester
M60 7LP

Telephone: 01612372585
Facsimile: 01612372383

3 February 2006

Private & Confidential
Prof N Beail, Consultant Clinical Psychologist
Clinical Psychology Unit, Department of Psychology
University of Sheffield
Western Bank
SHEFFIELD
S10 2TP

Dear Prof Beail

Full title of study: **Theory of Mind and Empathy in Deaf Adults in Community and Forensic Settings**
REC reference number: ***05/Q1410/127***

Thank you for your letter of 23 January 2006, responding to the Committee's request for further information on the above research and submitting revised documentation. The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

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

Ethical review of research sites

The Committee has designated this study as exempt from site-specific assessment (SSA). There is no requirement for other Research Ethics Committees to be informed or for site-specific assessment to be carried out at each site.

Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully. **Please note in particular the requirements relating to the submission of progress and other reports in points 4 and 10.**

Approved documents

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

Document	*Version*	*Date*
Application	5.0	28 November 2005
Investigator CV - Prof Nigel Beail		25 November 2005
Protocol	3	25 November 2005
Compensation Arrangements Letter from University		27 June 2005
Interview Schedules/Topic Guides Demographic	A: Deaf forensic participants	25 November 2005
Interview Schedules/Topic Guides Demographic	B: Deaf community participants	25 November 2005
Interview Schedules/Topic Guides Demographic	C: Hearing participants	25 November 2005
Advertisement	1	25 November 2005
Participant Information Sheet	C2: Hearing community	23 January 2006
Participant Information Sheet	A2 - Deaf forensic	23 January 2006
Participant Information Sheet	B2 - Deaf community	23 January 2006
Participant Information Sheet	A2 - Hearing community	23 January 2006
Participant Consent Form	A2 - Forensic participants	23 January 2006
Participant Consent Form	B2 - Community participants	23 January 2006
Research Proposal Costing Form		28 November 2005
Letter from funder		12 July 2005
Letter from Alpha Hospital, Bury	1	02 November 2005
Letter from tutor	2	
Letter to RGO from Supervisor		15 August 2005
Matrix of theories of empathy and theory of mind		25 November 2005
Sample items from measures		25 November 2005
Letter from tutor	1	30 July 2005

Research governance approval

You should arrange for the R&D department at all relevant NHS care organisations to be notified that the research will be taking place, and provide a copy of the REC application, the protocol and this letter.

All researchers and research collaborators who will be participating in the research must obtain final research governance approval before commencing any research procedures. Where a substantive contract is not held with the care organisation, it may be necessary for an honorary contract to be issued before approval for the research can be given.

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.

05/Q1410/127 Please quote this number on all correspondence

With the Committee's best wishes for the success of this project

Yours sincerely

Dr Gary Young
Chair

Email: elaine.hutchings@gmsha.nhs.uk

Enclosure: Standard approval conditions

Copy to:	Rachel Saunders Clinical Psychology Unit, Department of Psychology University of Sheffield Western Bank Sheffield S10 2TP Mr R Hudson The University of Sheffield Research Services Department New Spring House 231 Glossop Road Sheffield S10 2GW Dr A Carr Sheffield Health & Social Research Consortium Fulwood House Old Fulwood Road Sheffield S10 3TH Miss Sylvia Glenn Clinical Psychology Unit Department of Psychology University of Sheffield Western Bank Sheffield S10 2TP

Wrightington, Wigan & Leigh Research Ethics Committee
Room 181, Gateway House
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Manchester
M60 7LP
0161 237 2585

17 February 2006

Private & Confidential
Professor N Beail
Clinical Psychology Unit
Department of Psychology
University of Sheffield
Western Bank
Sheffield
S10 2TP

Dear Professor Beail

Study title: **Theory of Mind and empathy in deaf adults in community and forensic settings.**
REC reference: **05/Q1410/127**

Amendment number: **1**
Amendment date: **27 January 2006**

The above amendment was reviewed at the meeting of a Sub-Committee of the Research Ethics Committee held on 17 February 2006.

Ethical opinion

The members of the Committee present gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Notice of substantial amendment form	dated 31 January 2006
Changes to the proposal between 3 and 4	

Membership of the Committee

The members of the Ethics Committee present at the meeting were:

Dr Gary Young (Chair)	Lay member
Mrs Kate Kilshaw	Radiographer

NHS

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.

05/Q1410/127	Please quote this number on all correspondence

Yours sincerely

Elaine Hutchings
Committee Co-ordinator

E-mail: elaine.hutchings@gmsha.nhs.uk

Copy to:	Rachel Saunders Clinical Psychology Unit, Department of Psychology University of Sheffield Western Bank Sheffield S10 2TP Mr R Hudson The University of Sheffield Research Services Department New Spring House 231 Glossop Road Sheffield S10 2GW Dr A Carr Sheffield Health & Social Research Consortium Fulwood House Old Fulwood Road Sheffield S10 3TH Miss Sylvia Glenn Clinical Psychology Unit Department of Psychology University of Sheffield Western Bank Sheffield S10 2TP

Wrightington, Wigan & Leigh Research Ethics Committee
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0161 237 2585

21 April 2006

Private & Confidential
Professor N Beail
Clinical Psychology Unit
Department of Psychology
University of Sheffield
Western Bank
Sheffield
S10 2TP

Dear Professor Beail

Study title: **Theory of Mind and empathy in deaf adults in community and forensic settings.**
REC reference: **05/Q1410/127**

Amendment number: **2**
Amendment date: **22 March 2006**

The above amendment was reviewed at the meeting of a Sub-Committee of the Research Ethics Committee held on 21 April 2006.

Ethical opinion

The members of the Committee present gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Notice of substantial amendment form	dated 23 March 2006

Membership of the Committee

The members of the Ethics Committee present at the meeting were:

Dr Gary Young (Chair)	Lay member
Mr John Enfield	Lay member

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.

05/Q1410/127	**Please quote this number on all correspondence**

Yours sincerely

Elaine Hutchings
Committee Co-ordinator

E-mail: elaine.hutchings@gmsha.nhs.uk

Copy to:	Rachel Saunders Clinical Psychology Unit, Department of Psychology *University of Sheffield* Western Bank Sheffield S10 2TP Mr R Hudson The University of Sheffield Research Services Department *New Spring House* 231 Glossop Road Sheffield S10 2GW Dr A Carr Sheffield Health & Social Research Consortium *Fulwood House* Old Fulwood Road Sheffield S10 3TH Miss Sylvia Glenn Clinical Psychology Unit Department of Psychology University of Sheffield Western Bank Sheffield S10 2TP

3. Measures

3.1 Interview Schedules

3.2 Exemplars from tests

3.1 - Interview Schedules

Version A – Deaf Forensic

Version B – Deaf Community

Version C – Hearing Community

A: Deaf forensic participants **Initial interview to gather demographic information**

Participant identifier: .....

Age: .....

Gender: male / female

Degree of deafness: total / profound / severe / moderate / hard of hearing

Cause of Deafness: Genetic / Rubella / Meningitis / other .....

Born Deaf? Yes / no – when go deaf? .....

Age Deafness diagnosed? .....

First Language: Lip reading / **BSL / SSE**

Psychiatric diagnoses: .....

Type of offence: .....

Language: BSL

What age did you start to learn BSL? .....

Family deaf / hearing?

Anyone at home sign? Yes / no.

Did you live with your family? / go to boarding school / other .....

Education

What sort of school did you attend? Oral / BSL / total communication / mainstream / other

Do you have any qualifications in BSL? / English? .....

What is your highest educational qualification? .....

Feedback

Do you wish to receive general feedback from the research? Yes / no

If so, this will be available at a community meeting.

Written feedback will also be available.

Group B: Deaf Community

Questions

Check:	
✓	BSL / SSE
×	*seen psychiatrist / been in mental health services*
×	*been in trouble with police about offence to person*

Age and date of birth .....

Deafness

Born deaf? Yes / no. If no, when and why go deaf? .....

Profoundly deaf / severe / total / moderate / hard of hearing ?

Genetic / Rubella / Meningitis / other .....

How old when they realised you were deaf?

Language: BSL

Family – Deaf / hearing?

What age did you start to learn BSL?

Any one at home sign? Yes / no.

Did you live with your family? / go to boarding school (what age?) / other .....

Education

What sort of school did you go to? Oral / BSL / total communication / mainstream

Do you have any qualifications in BSL? / English? .....

What is your highest level educational qualification? GCSE / NVQ / A-level / Degree

Do you have a job? .....

Feedback

Do you wish to receive general feedback from the research? Yes / no

Group C: Hearing Community

Questions

Check:	
✓	first language is English
×	seen psychiatrist / been in mental health services
×	been in trouble with police about offence to person
×	not done BSL level 1

Age and date of birth

Language: English

Have you ever had problems with hearing?

Do your family use the same spoken language as you? (i.e. English)

Did you live with your family? / go to boarding school / other

Education

What sort of school did you attend? mainstream / other

Do you have any qualifications in English?

What is your highest level of educational qualification?

Do you have a job?

Feedback

Do you wish to receive general feedback from the research? Yes / no

3.2 - Exemplars from tests

(adapted versions)

Reading the Mind in the Eyes

Practice item

(birthday party)
playful

(nurse, soldier)
comforting

irritated
(junk mail)

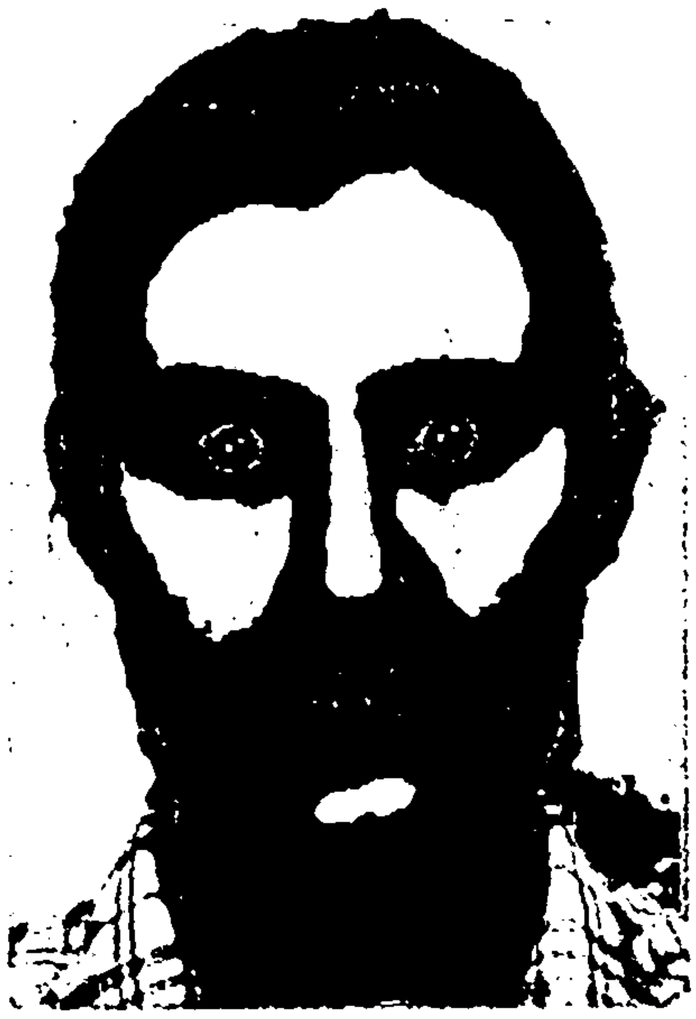
bored
(history class)

Projective Imagination Test

What is happening in this picture? What do you think might be the story shown in this drawing?

What do you think the young man might be feeling / thinking?

Basic Emotion Recognition Test



4. Other

4.1 Recruitment poster

4.2 Information sheets

4.3 Consent form exemplar

4.1 Recruitment poster

What am I thinking?....

.... I am wondering if you'd volunteer for my research?

What research? – I want to find out if Deaf people and hearing people are different at telling how someone feels by just looking at their face. I am also comparing patients with non-patients.

What would you have to do? – I would show you pictures of faces, eyes and some drawings. You would tell me what you think the person is thinking or feeling. There would be a few other questions and simple tests to help me to compare groups of people.

Where and how long? – We can arrange somewhere easy for you, maybe at Deaf club, university, college etc. It would take about 1 hour 30 minutes. I'm not able to pay you, but I can reimburse travel by public transport if needed.

Who do I need? – Deaf and hearing adults who have not been found guilty of a crime and have not seen a psychiatrist or psychologist for a mental health problem.

Interested? Want to know more? – e-mail me on ------, or text / call me on -----.

Thanks for reading,
Sylvia
(Trainee Clinical Psychologist, University of Sheffield)

4.2 Information sheets

Version A Deaf forensic

Version B Deaf community

Version C Hearing community

Version A2 (23-01-06): Deaf forensic

THE UNIVERSITY OF SHEFFIELD
Clinical Psychology Unit
Department of Psychology
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Email: dclinpsy@sheffield.ac.uk

Unit Director: Prof Graham Turpin
Assistant Unit Director : Prof Pauline Slade
Course Director: Prof Gillian Hardy

Clinical Practice Director: Ms Joyce Scaife
Course Administrator: Carole Gillespie
Prof Nigel Beail

Recognising Feelings

Do you want to take part in this research? Read this sheet before you decide. Do you have any questions? If anything is not clear, ask us.

What is this research about?
It is often helpful to understand what other people may be thinking or feeling. Deaf children (with hearing parents) learn this skill later than other children. We want to see how easy or difficult it is for Deaf and hearing adults to recognise feelings.

We also want to see if there are any differences in how easy it is to recognise feelings between Deaf people in a secure hospital and other people who are Deaf.

If I take part, what will happen?
You would meet with a researcher and a BSL interpreter for about 1hr30. A support worker can be present if you want. This would be at the hospital. We will ask some questions about you (e.g. when did you learn to sign?). Then we will do some short tests. You look at pictures and choose what you think the person may be feeling. With your permission, I would get information on your history and ability from your files.

Can I stop the study at any time?
Yes. You do not have to take part. If you do agree, you can stop at any time. If you say 'yes' and later change your mind, let me know and I will destroy your answers. If there are any questions you do not like, you can choose not to answer them. The study should not upset you. If you do get upset we will stop the study and give you support.

Will it effect my treatment or care?
No. Your treatment will not be affected in any way by taking part in this research, or by deciding not to.

Will my information be confidential?
Your name will be kept separate from your answers. No-one will know which answers are yours. Your name will not be written in any reports of the study.
Some staff at the hospital may know if you have taken part in this research but it will not affect your care. If you tell us something which means you or someone else is at risk or in danger, we have to pass this information on to the clinical team.

What do I do if I'm not happy about something?
If you have *any* complaint or concern, please contact:

- *Prof Nigel Beail,* at Clinical Psychology Unit, Sheffield University (Tel. 0114 2226632; Fax 0114 2226610) *or*
- *Dr Sue O'Rourke* at Alpha Hospitals (Tel. 0161 7624730; Minicom 0161 7627235; Fax 0161 7624747)

If this is not good enough, you can use the normal NHS complaints procedure;

- *Wendy Hedland* (Tel 0114 2718956; Fax 0114 2716738)

Or you can use the normal University complaints procedure; contact: *'Registrar and Secretary'* (Firth Court Western Bank, Sheffield S10 2TN. Tel 0114 2221100; Fax 0114 2221103)

Thank you for taking time to read this. Feel free to ask any questions.

Version B2 (23-01-06): Deaf community

THE UNIVERSITY OF SHEFFIELD
Clinical Psychology Unit
Department of Psychology
Doctor of Clinical Psychology (DClin Psy) Programmes (Pre-registration and post-qualif
Clinical supervision training and NHS research training and consultancy

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Unit Director: Prof Graham Turpin
Assistant Unit Director : Prof Pauline Slade
Course Director: Prof Gillian Hardy
Clinical Practice Director: Ms Joyce Scaife
Course Administrator: Carole Gillespie
Prof Nigel Beail

Recognising Feelings

Do you want to take part in this research? Read this sheet before you decide. Do you have any questions? If anything is not clear, ask us.

What is this research about?

It is often helpful to understand what other people may be thinking or feeling. Deaf children (with hearing parents) learn this skill later than other children. We want to see how easy or difficult it is for Deaf and hearing adults to recognise feelings.

We also want to see if there are any differences in how easy it is to recognise feelings between Deaf people in a secure hospital and other people who are Deaf.

If I take part, what will happen?

We will meet with you for about 1hr30. There will be a BSL interpreter. This would be at a local Deaf club or community centre. We will ask some questions about you (e.g. when did you learn to sign?). Then we will do some short tests. You look at pictures and choose what you think the person may be feeling. There are some puzzles to test your general ability.

Can I stop the study at any time?

You do not have to take part. If you do agree, you can stop at any time. If you say 'yes' and later change your mind, let me know and I will destroy your answers. If there are any questions you do not like, you can choose not to answer them. If you choose not to take part, or to stop, it will not affect any services you may use. The study should not upset you. If you do get upset we will stop the study and give you support.

Will my information be confidential?

Your name will be kept separate from your answers. No-one will know which answers are yours. Your name will not be written in any reports of the study. If you tell us something which means you, or someone else, is at risk or in danger, we have to pass this information on to someone who can help.

What do I do if I'm not happy about something?

If you have *any* complaint or concern, please contact:

- *Prof Nigel Beail,* at Clinical Psychology Unit, Sheffield University (Voice Tel. 0114 2226632; Fax 0114 2226610) *or*
- *Dr Sue O'Rourke* at Alpha Hospitals (Voice Tel. 0161 7624730; Minicom 0161 7627235; Fax 0161 7624747).

If this is not good enough, you can use the normal NHS complaints procedure;

- *Wendy Hedland* (Tel 0114 2718956; Fax 0114 2716738)

Or you can use the normal University complaints procedure; contact:

- *'Registrar and Secretary'* (Firth Court Western Bank, Sheffield S10 2TN. Tel 0114 2221100; Fax 0114 2221103)

Thank you for taking time to read this. Feel free to ask any questions.

Version C2 (23-01-06):: Hearing community

THE UNIVERSITY OF SHEFFIELD
Clinical Psychology Unit
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Doctor of Clinical Psychology (DClin Psy) Programmes (Pre-registration and post-qual
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Unit Director: Prof Graham Turpin
Assistant Unit Director : Prof Pauline Slade
Course Director: Prof Gillian Hardy
Clinical Practice Director: Ms Joyce Scaife
Course Administrator: Carole Gillespie
Prof Nigel Beail

Recognising Feelings

Do you want to take part in this research? Read this sheet before you decide. Do you have any questions? If anything is not clear, ask us.

What is this research about?
It is often helpful to understand what other people may be thinking or feeling. Deaf children (with hearing parents) learn this skill later than other children. We want to see how easy or difficult it is for Deaf and hearing adults to recognise feelings.

We also want to see if there are any differences in how easy it is to recognise feelings between Deaf people in a secure hospital and other people who are Deaf.

If I take part, what will happen?
We will meet with you for about 1hr30. This would be at a local venue, such as a community centre. We will ask some questions about you (e.g. when did you learn to speak?). Then we will do some short tests. You look at pictures and choose what you think the person may be feeling. There are some puzzles to test your general ability.

Can I stop the study at any time?
You do not have to take part. If you do agree, you can stop at any time. If you say 'yes' and later change your mind, let me know and I will destroy your answers. If there are any questions you do not like, you can choose not to answer them. If you choose not to take part, or to stop, it will not affect any services you may use. The study should not upset you. If you do get upset we will stop the study and give you support.

Will my information be confidential?
Your name will be kept separate from your answers. No-one will know which answers are yours. Your name will not be written in any reports of the study. If you tell us something which means you, or someone else, is at risk or in danger, we have to pass this information on to someone who can help.

What do I do if I'm not happy about something?
If you have *any* complaint or concern, please contact:

- *Prof Nigel Beail,* at Clinical Psychology Unit, Sheffield University (Voice Tel. 0114 2226632; Fax 0114 2226610) *or*
- *Dr Sue O'Rourke* at Alpha Hospitals (Voice Tel. 0161 7624730; Minicom 0161 7627235; Fax 0161 7624747).

If this is not good enough, you can use the normal NHS complaints procedure;

- *Wendy Hedland* (Tel 0114 2718956; Fax 0114 2716738)

Or you can use the normal University complaints procedure; contact:

- *'Registrar and Secretary'* (Firth Court Western Bank, Sheffield S10 2TN. Tel 0114 2221100; Fax 0114 2221103)

Thank you for taking time to read this. Feel free to ask any questions.

4.3 Consent form exemplar

Version A – Forensic participants

Version B – Community participants

THE UNIVERSITY OF SHEFFIELD
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Fax: 0114 2226610
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Unit Director: Prof Graham Turpin
Assistant Unit Director : Prof Pauline Slade
Course Director: Prof Gillian Hardy
Clinical Practice Director: Ms Joyce Scaife
Course Administrator: Carole Gillespie
Prof Nigel Beail

A2 (23/01/06): Forensic Participants

Participant Identification Number for this study: .....

CONSENT FORM

Recognising Feelings

Title of Project: Theory of Mind and Empathy in Deaf Adults in Community and Forensic Settings.

Name of Researcher: Sylvia Glenn

Please tick box

1. I confirm that I have understood the information sheet (version A.2) for this study. I have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary. I know I can withdraw at any time, without giving any reason. My medical care or legal rights will not be affected. ☐

3. I understand that Sylvia Glenn (researcher) may look at sections of my hospital notes where it is relevant to my involvement in the research. I give permission for Sylvia Glenn to have access to my records. ☐

4. I agree to take part in the above study. ☐

Name of Participant	Date	Signature
Name of Person taking consent (if different from researcher)	Date	Signature
Sylvia Glenn Researcher	Date	Signature

1 for participant; 1 for researcher; 1 to be kept with hospital notes

THE UNIVERSITY OF SHEFFIELD
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Email: dclinpsy@sheffield.ac.uk

Unit Director: Prof Graham Turpin
Assistant Unit Director : Prof Pauline Slade
Course Director: Prof Gillian Hardy
Clinical Practice Director: Ms Joyce Scaife
Course Administrator: Carole Gillespie
Prof Nigel Beail

B2 (23/01/06): Community Participants

Participant Identification Number for this study: .....

CONSENT FORM

Recognising Feelings

Title of Project: Theory of Mind and Empathy in Deaf Adults in Community and Forensic Settings.

Name of Researcher: Sylvia Glenn

Please tick box

1. I confirm that I have understood the information sheet (version B.2 / C.2) * for the above study. I have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary. I know I can withdraw at any time, without giving any reason. My medical care or legal rights will not be affected. ☐
3. I agree to take part in the above study. ☐

Name of Participant	Date	Signature
Name of Person taking consent (if different from researcher)	Date	Signature
Sylvia Glenn Researcher	Date	Signature

1 for participant; 1 for researcher;

*Delete as appropriate

Appendix B

Appendices to Literature Review

Table 1:
Summary of results from 22 studies of deaf children's performance on false belief tests

Table 2:
Summary of studies using false belief methodologies with deaf children and adults

Table 3:
Summary of studies examining mental-state production, understanding and classification

Table 4:
Summary of studies examining emotional recognition

Table 5:
Summary of studies examining perspective taking

Table 6:
Summary of studies examining emotional reactions and responses

Table 7:
Summary of studies examining the use of emotional skills training

Abbreviations used in Tables 1-7

D= deaf, H= hearing

DD= deaf child, deaf parent (ie. Native signer), DH = deaf child, hearing parent

SL = sign language, TC= Total Communication, BSL = British Sign Language

CI= cochlea implant, HA= hearing aid

ToD= Teacher of Deaf

ASD = autistic spectrum disorder

IQ = intelligence

FB = false belief, CL = changed location, AR = appearance reality, CA = changed appearance, MC/A = misleading container/appearance, TP = thought picture

Appendix Table 1

Summary of results from 22 studies of deaf children's performance on false belief tests

Mean Age or (range)	N*	Pass-rate (%) or mean pass/total	Test	Author
Native signers - Deaf child with Deaf parent (DD)				
5	9	~2.1/3	2-trial CL, 1-trial MC	**1**
5.4	13	100%	3 first-order tasks	**5**
5.9	19	1.42/2	2 FB TP (MC)	**3**
6.0	12	1.58/2	2 FB TP **(good BSL)**	**3**
6	10	~2.3/3	2-trial CL, 1-trial MC	**1**
6.5	37	90% pass 2/3 trials	MC, CL	**4**
7	9	~2.2/3	2-trial CL, 1-trial MC	**1**
7.1	11	46%	1-trial CL **(DD & DSP)**	2
7.1	11	50%	1-trial MC **(DD & DSP)**	2
7.1	11	54%	1-trial CA **(DD & DSP)**	2
8.7	5	2.5/3	3-question MA	7
8.9	9	89%	2-trail CL	8
9.4	11	82%	2-trial CL	13
9.4	11	91%	MC	13
9.4	11	100%	CA	13
10.7	11	82%	FB (not defined)	10
Late signers - Deaf child with hearing parent (DH)				
5	4	~0.75/3	2-trial CL, 1-trial MC	**1**
6	5	~1.25/3	2-trial CL, 1-trial MC	**1**
6.5	11	64%	1-trial CL	2
6.5	11	55%	1-trial MC	2
6.5	11	27%	1-trial CA	2
6.7	32	0.34/2	2 FB TP (MC)	**3**
7	17	~1.4/3	2-trial CL, 1-trial MC	**1**
7.1	12	0.17/2	2 FB TP **(good BSL)**	**3**
7.3	54	~45% passed 2/3	3 first-order (CL, MC)	**4**
7.5	22	<50% pass 2/3 tests	3 first-order tasks	**5**
8.4	30	40%	2-trail CL	6
8.7	7	1.1/3	3-question MA	7
8.9	26	46%	2-trail CL	8
8.9	13	54%	1-trial MC (standard)	9
8.9	13	38%	1-trial CL (standard)	9
8.9	13	69%	1-trial CL (intent)	9
8.9	13	54%	1-trial MC (active deception)	9
8.9	13	69%	2-trial MC **(non-verbal)**	9
9.2	14	64%	1-trial CL **(TC*)**	2
9.2	14	21%	1-trial MC **(TC*)**	2
9.2	14	50%	1-trial CA **(TC*)**	2
9.3	24	54%	1-trial **non-verbal** CA	6
9.3	21	38%	CA	9
9.3	21	48%	MC	9
9.4	34	<50%	2-trial CL, MC, CA	6
10.1	36	33%	false belief (not defined)	10
10.6	26	35%	2-trial CL	11
13.9	11	91% **'early learners'**	2-trial thought picture (MC)	12
24.5	11	36% **'late learners'**	2-trial thought picture (MC)	12

Notes:

N*: sample sizes for each test described

a: n=32 across 3 age groups (total sample includes 2 native with 30 late signers)

b: n=22 across two age groups

~: approximate figures from graphs

TC*: Children used Total Communication, not just sign.

DSP: Deaf child with signing parent (BSL Level-II/above)

Appendix Table 1 *continued*

Mean Age or (range)	N*	Pass-rate (%) or mean pass/total	Test	Author
Signers (DD/DH unspecified/mixed)				
(6-8)	48	60%	1-trial CL	14
6	a	17%	2-trial CL	15
9.7	22	70%	1-trial CL	16
10	a	10%	2-trial CL	15
15	a	60%	2-trial CL	15
Mixed late signers & oral (DH)				
(4-6)	b	0%	verbal FB	21
(4-9)	22	no diff from hearing	**non-verbal** FB	21
5	2	0%	9-trial misleading stimulus &CL	22
6	3	33%	9-trial misleading stimulus &CL	22
7	4	75%	9-trial misleading stimulus &CL	22
(7-9)	b	70%	verbal FB	21
8	9	78%	9-trial misleading stimulus &CL	22
9	8	100%	9-trial misleading stimulus &CL	22

Authors:

1: **Courtin** & Melot (2005), 2: Jackson (2001), 3: **Woolfe** et al (2002), 4: **Courtin** (2000), 5: **Courtin** & Melot (1998***), 6: Peterson & Siegal (1998*), 7: Remmel et al (1998*), 8: Peterson & Siegal (1997*), 9: Peterson (2002), 10: Peterson, Wellman & Lui (2005), 11: Peterson & Siegal (1995*), 12: Morgan & Kegl (2006), 13: Peterson & Siegal (1999***), 14: Deleau (1996*), 15: Russell et al (1998*), 16: Steeds et al (1997*), 17: de Villiers & de Villiers (1999**), 18: Figuera-Costas & Harris (2001), 19: Peterson (2004), 20: de Villiers et al (1997*), 21: Moeller & Schick (2006), 22: Lundy (2002). (* details cited in Table 1 in Peterson & Siegal (2000), ** details cited in Table 1 in Peterson (2004), *** merged details from these two tables).Authors in **bold** known to be deaf signers themselves.

Appendix Table 2

Summary of studies using false belief methodologies with deaf children and adults

Authors (date) **Location**	Experimenters	Deaf sample	Comparison Sample(s)	Methods
Courtin (2000) France	Signers tested in SL by D author; oral tested by familiar assistant	N=155 profoundly D (bilateral >90dB), age 5-8y 3 groups: N=45 oral DH, (6y11) N=54 signers DH, (7y4) N=37 signers DD, (6y6)	N=39 hearing, age 4-6y (5y1)	CL, MC
Courtin & Melot (2005) France	as above	N=88 bilateral profound D since birth (>90dB), no CI, teacher rated no deficits in lang/IQ 3 groups: N=34 oral DH, 4x age 5y, 14x age 6y, 16x age 7y N=26 signers DH, 4x age 5, 5x age 6y, 17x age 7y N=28 signers DD, 9x age 5y, 10x age 6y, 9x age 7y	N=36 hearing, 12x age 5y, 12x age 6y, 12x age 7y. (teacher rated no deficits in lang/IQ)	AR Classic FB (CL, MC - trained in terms first)
Figueras-Costa & Harris (2001) Spain	Hearing-status not known. Tested in spoken Catalan/Spanish.	N=21, prelingual severe-profound D, oral, DH, all HA except 1xCI. 2 groups: N=11, age 4y7-6y5 (5y6) N=10, age 6y9-11y11 (9y7)	None	Nonverbal FB (hiding & finding game) and verbal FB
Jackson (2001) Wales	BSL Level-II (recognised not same as native)	4 groups: N=11 prof D, 'native' signers, 4DD, 7DH (parents signed >BSL-L2), age 5y2-10y10 (7y1) N=11 prof D, late signers, DH, age 4y10-8y3 (6y6) N=14 severe-prof D from HI unit, TC, age 5y2-12y11 (9y2) N=14 severe-prof D, oral, age 4y11-11y1 (7y6)	Hearing controls N=48, age 3y N=24, age 4y N=24, age 7y	First order ToM (CL, MC, false photo task), BSL receptive task (or BPVS for hearing), 4 nonverbal exec function tasks. Subset given 2nd-order (ice-cream van)
Lundy (2002) Denver	ASL teacher – level not assessed – signed directly to ppts	N=35 congenitally D, (79% >90dB, others >65dB) various schools DH, 10xCI, others HA, age 5y7-10y5. (5 excluded as failed control Qs): 2 groups: N=20 SL N=9 oral	None	4 FB tests (CL, AR, MC, misleading picture), child's expressive language competency, parental self-report of SL vocab for mental-states.

Appendix Table 2 *continued*

Authors (date) Location	Experimenters	Deaf sample	Comparison Sample(s)	Methods
Moeller & Schick (2006) Midwest USA	Experienced & fluent in SL, experienced in testing language skills of D	N=22 pairs of H mums & and D children with prelingual sensorineural hearing loss, >85dB, identified <24-months, mixed SL& oral, 10-HA, 10- CI (2 non-users), 2 unaided, age 4-10 (6.9)	N=26 pairs of hearing mums & and children from higher SES, age 4-6 (5.0)	3 play activities with mums (10-minutes free-play, 15-minutes joint play with tinker toys, 10-minutes looking at family photos, 15-minutes watching and discussing movie scenes) videoed & mums mental-state language coded (thoughts, beliefs/states of knowledge), mum's sign vocab test, FB – verbal & nonverbal
Morgan & Kegl (2006)	See Table 3			
Peterson (2002) Australia	Experimenter & interpreter	Prelingually severe-profound DH **Exp 1**: N=21 SL, age 6y8-12y6 (9y3) **Exp 2**: N=21 SL (same as Exp 1) **Exp3**: N=13 SL, age 7y7-11y10 (8y11)	**Exp 1**: N=25 hearing, age 4y1-5y8 (4y9) **Exp 2**: N=26 normal development, age 3y10-5y1 (4y6) N=14 ASD, age 5y3-13y3 (9y8), verbal mental age 4y **Exp 3**: N=26 hearing pre-schoolers, age 4y-5y3 (4y7) N=autism, age 5y9-10y8 (8y3)	**Exp 1**: unseen change (ribbons and portrait) **Exp 2**: MC, false drawing task **Exp 3**: MC, draw beliefs, choose drawing, active deception, CL (FB and intent)
Peterson (2004) Australia	Oral – spoke loud & distinctly TC – spoke &SL (except for verbal mental age - VMA)	N=26 oral D severe-profound, DH, (half oral only, half TC) 2 groups: N= 13 with CI, age 4y2-11y2 (8y0), VMA 5y11 N=13 with HA, age 5y0-12y1 (7y6), VMA 6y10	2 groups: N=9, high functioning autism, age 5y3-12y6 (8y6), VMA 7y3 N=17 normal development, age 4y1-5y8 (4y10), VMA 5y11	FB - CL, MC VMA (orally) nonverbal mental ability

Appendix Table 2 *continued*

Authors (date) **Location**	Experimenters	Deaf sample	Comparison Sample(s)	Methods
Peterson, Wellman & Lui (2005) Australia	Experimenter & interpreter (familiar to children but both unaware of interest in parents)	Prelingually severe-profound D children, attending TC Units, with preference for SL. 2 groups: N= 11, native signers (DD), age 6-13y (10.67) N=36, late signers (DH), age 5-13y (10.01)	2 groups: N=36, high functioning autistic (ASD), age 6-14y (9.32) N=62, 'typical' development, age 3-6y (4.50)	Diverse desires, diverse beliefs, knowledge access, FB, hidden emotion (modified from Wellman & Lui, 2004)
Woolfe, Want & Siegal (2002) UK	Tested in BSL by Deaf native BSL author	**Exp 1**: prelingually profound D 2 groups: N=32 late-signers age 4-8 (6y8), N=19 native-signers age 4-8 (5y10) **Exp 2**: 4 groups: (participants from Exp 1) N=21 late-signers, mean age 7y10 N=18 native-signers, mean age 6y0	**Exp 1**: N= 40 hearing, mean ages 3y7 (n=20) & 4y4 (n=20) **Exp 2**: none	**Exp 1**: TP tasks (2x FB, 2x true belief - TB), BSL Receptive Skills Test **Exp 2**: executive functioning (Wisconsin card sort), False photo task
Woolfe, Want & Siegal (2003) UK	Tested in BSL by Deaf native BSL author	N=20 prelingually profound D native signers (same children as in Woolfe et al, 2002), both parents Deaf, age 4y-8y6 (5y11) and their siblings (also native signers, but includes both D/H), age 4y2-16y3 (7y11)	None	Quality of sibling relations, Referential communication, sibling quality interview, [results from Woolfe et al (2002) used: BSL Receptive Skills Test, 2 TP tests (FB)]

Appendix Table 3

Summary of studies examining mental-state production, understanding and classification

Authors (date) **Location**	Experimenters	Deaf sample	Comparison Sample(s)	Methods
Clark *et al* (1996) USA	Tested singularly / small groups in college dorm (paid).	N=41 severe-profound D college students, DH, mainly SL, age (21.6y).	Hearing participants from another study – no details reported.	Written questionnaire: Rate similarity of 2 mental verbs as to how you would use your mind – 17 verbs of knowing used.
Dyck & Denver (2003)	see Table 4			
Dyck *et al* (2004)	see Table 4 (Emotion Vocabulary Test)			
Marshark, Green, Hindmarsh & Walker (2000) Australia	Used speech & SL simultaneously, transcripts by qualified interpreter	N= 15 sev-prof D (DH), TC, age 9y7-15y10 (13y1)	N=15 hearing, age 10y6-15y5 (13y2)	Children asked to tell story as if to child of same hearing status with less language skills, about fantasy scenario (flying saucer/living under ocean). Asked 'what would the people be like?' & 'what would happen to you?' Examined stories for ascribing behaviour-relevant states of mind to self/other.
Morgan & Kegl (2006) Nicaragua	Fluent adult signer	N=22 prof D SL, DH, attended D-SL school. Age 7-39y, first learnt sign 5-33y. <u>2 groups:</u> N=11 early learners (access to SL before 10y), N=11 late learners (access after 10y)	None	FB – TP (Woolfe et al, 2002), 2-trials FB, 2-trial true belief. Moral dilemma narrative – participants asked to explain the events of a non-verbal cartoon to a fluent adult signer. Mental state references were scored against list of 8 propositions.
Rhys-Jones & Ellis (2000)	see Table 5			
Rieffe & Meerum Tergwogt (2000) Netherlands	Non-familiar hearing staff member, used SL	N=23 severe-profound D (pre-lingual), 22 DH, 1 DD, all used SL, 10 x 6y (6y11), 13x 10y (10y11) NB: Older deaf had done PATH (Promoting Alternative Thinking Strategies) from age-6.	N=85 hearing, 42x (6y3), 43x (10y4)	6 stories: how do they feel & why? Recorded (tape/video) & transcribed. Deaf person checked accuracy of transcriptions (no inaccuracies).

Appendix Table 4

Summary of studies examining emotional recognition

Authors (date) Location	Experimenters	Deaf sample	Comparison Sample(s)	Methods
Al-Hilawani, Easterbrooks & Marchant (2002) USA and UAE	USA – prof of D Ed.& student in pre-service training UAE – pre-service college seniors training with D. Simultaneous speech and SL used with D.	USA: N=14 hearing loss, school for D, low SES age 8-11y (10.06y) UAE: N=14 hearing loss, in special education centres, age 8-11y (10.34y) NB: unclear DH/DD& level of deafness – mix of D& hard-of-hearing	USA: N=22 hearing, private school, same area as hearing impaired, age 8-11y (8.9y) UAE: N=22 hearing, mix of UAE citizens & expatriates, age 8-11y (10.34y)	Meta-cognition tool (Photos of objects, events, behaviours & situations. Given 4 choices of what picture conveyed. Requires attention to facial expressions & all elements in picture)
Dyck *et al* (2004) Australia	Test presented in format best suiting child – tester qualification /hearing status not stated	N=49 mild-prof hearing impaired (HI), varied communication styles, DH/DD not stated 2 groups: 'Adolescents' N=33, (2 mild, 2 moderate, 5 severe, 25 profound), age 12-18 (15.28y) 'Children' N=16, (1 moderate, 4 severe, 11 profound), age 6-11y (9.29y) Matched verbal ability sample: (excluded raw scores <9 & >27 on comprehension, <7 & > 21 similarities) N=23, mean age 14.23y	4 groups: -Visually impaired (VI): 'Adolescents' N=18, age 12-18y (13.97y) 'Children' N=24, age 6-11y (8.12y) -Non-sensory impaired (NSI) from same schools as disabled: 'Adolescents' N=42, age 12-18y (14.58y) 'Children' N=30, age 6-11y (8.77y) Matched verbal ability samples: VI: N=26, mean age 11.28y NSI: N=34, mean age 10.30y	Emotion Recognition Scales: 1 test of facial expressions: Fluid Emotions Test – morphs from one photo to another of changing emotional expression 3 tests of Emotional understanding Comprehension Test – 11 scenarios, asked what character feels. Unexpected Outcomes Test - 12 scenarios with an unlikely emotion, asked to provide information that would give reasons for the emotion. Emotional Vocabulary Test–define 24 emotion words. Weschler Verbal Scales (information, comprehension, similarities)
Dyck & Denver (2003) Australia	Hearing status of experimenter not known. No detail about communication methods.	N=14 D, oral, age 9-13y (11.84). Of whom: 3 moderate, 2 severe & 9 profound / 7-CI, 7-HA / 4 had ADD/ADHD (1 also with ODD), 1 Downs Syndrome, 1 dyspraxia.	N=30 hearing mean age 8.77 (from other study – were comparison group for post-test results only)	"The Funny Faces Program" -emotional understanding program (11 lessons). Emotional Recognition Scales pre & post test: (Fluid Emotions Test, Comprehension Test, Emotional Vocabulary)

Appendix Table 4 *continued*

Authors (date) Location	Experimenters	Deaf sample	Comparison Sample(s)	Methods
Goldstein & Feldman (1996) USA	** hearing participants	**No deaf group.** N=30 hearing undergrads at arts uni, on 2nd level (or higher) American SL class, exposure to signing 10 month-5y (2.1y). No ages given.	N=30 hearing undergraduates at arts uni, with no SL/D friends. No ages given.	20 silent video clips of people expressing emotions -choose from happy, sad, fear-surprise, anger & disgust.
Goldstein, Sexton & Feldman (2000) USA	** same hearing participants as for 1996 paper	**No deaf group.** N=27 hearing undergrads (details as above)	N=28 hearing undergraduates, non-signers (as above)	Asked to convey 6 emotions to video. Tapes shown to untrained non-signing judges to identify emotions.
Kubota *et al* (2003) France	Interviews in French SL	N=11 D adults with schizophrenia, consecutive patients at one hospital, loss of hearing <2y, 'mother tongue' SL, good social functioning, good SL comprehension, mean age 26.36	N=14 hearing adults with schizophrenia at same hospital, mean age 30.71 N=10 healthy hearing medical staff at hospital, mean age 32.40	Affective facial-labelling task (48 photos of 6 emotions – written labels) Benton Facial Recognition Task (facial feature processing)
McCullough *et al*, 2005	No detail given	N=10 DD signers, prelingually severe-profound D, attended college, right-handed, mean age 29.4y	N=10 hearing non-signers, attended college, right-handed, mean age 24.2y	Static facial expression stimuli generated by SL interpreters, neutral expression, 6 emotional, 6 adverbial expressions for 10 verbs. Button press response. Face only/face with verb. Structural MRI & fMRI scans.
Schiff (1973) USA	D were instructed using speech, finger spelling & SL.	N=36 D adults (college students). No details given of level of deafness or age.	N=49 hearing adults (college students). No ages given.	27 filmed cartoons of motions & expressions (simple circular face drawings of happy, angry, sad & nonsense faces). Judged on friendly –hostile scale.
Weisel (1985) USA	Films of D native signers.	N=45 male D male university students. 25 had congenital hearing loss, 9 lost hearing by age 3y. All born in USA. Age 18-35 (23.8y). Text implies they use SL.	N=60 hearing university students, born in USA. No serious hearing difficulties, no frequent contacts with D or knowledge of SL. Age 18-35 (25.4y).	Films of emotion expressions in SL (by D native signers). Matched film content to 1/6 photos of facial expressions.

Appendix Table 5

Summary of studies examining perspective taking

Authors (date) Location	Experimenters	Deaf sample	Comparison Sample(s)	Methods
Dyck *et al* (2004)	see Table 4 (Comprehension Test, Unexpected Outcomes Test)			
Howley & Howe (2004) Glasgow	Level 2 BSL	**Exp 1:** N= 10 mod-prof D from TC school (6DD) Age 6.94-8.93 (8.02) **Exp 2:** N= 25 sev-prof D (20DH, 4 D school, 21 mainstream). Age 5.08-11.58. 2 group: young N=12, mean age 7.0, older n=13, mean age 9.89.	**Exp 1:** N= 10 hearing, mean age 7.98 **Exp 2:** N= 20 hearing, mean age 1) 7.05, 2) 9.74	Perceptual task (boy & police dolls in 4 sectioned room – what can policeman see?) Affective role-taking task (cartoon: how does central character feel and why? Would late arriving character missing information about previous event know why central character felt that way?).
Meerum Terwogt & Rieffe (2004a) Netherlands	Non-familiar staff member – SL status not known	**Exp 1:** as published in 2000 **Exp 2:** N= 47 prof deaf, SL, mostly DH, age 8-12y	**Exp 1:** as published in 2000 **Exp 2:** N=53 hearing, age 8-12y	**Exp1:** as published in 2000 **Exp 2:** role-taking (desirable event cancelled due to uncontrollable event/parents decision, ratio 1:1, asked how would character feel &why)
Meerum Terwogt & Rieffe (2004b) Netherlands	Non-familiar staff member – highly skilled in SL	N= 21 profoundly D at D-school, signers, most DH, 12 boys age 11y3-12y10 (12y1), 9 girls age 10y5-12y4 (11y4). Av nonverbal IQ 103.33.	N=36 hearing, 20 boys age 9y8-12y10 (11y1), 16 girls age 9y8-12y1 (11y1)	2 scenarios (mum has a FB, correcting it achieves goal – told scenario and asked what would say to mother?)
Rhys-Jones & Ellis (2000) Wales	All tested by author S signer. Hearing had interpreter into speech.	<u>2 groups:</u> N=20 severe-profound D, D-school, SL 1st/preferred language, 5DD, 15DH, age 11-16y (13.56) N=14 severe-profound D, D-school, 1DD, 13DH, age 6-10y (7.94)	<u>2 groups:</u> N=20 hearing, matched, age 11-16y (13.43) N=20 hearing, 6-10y (7.65)	Picture sequencing task (testing understanding of mechanical, behavioural, & intentional events), asked to give narrative on story, social judgement task
Rieffe, Meerum Tergwogt & Smit (2003) Netherlands	Non-familiar hearing staff member, used SL. D person checked transcriptions.	N=47 profound prelingual D (mean 108.72dB), 1DD, 46DH, primary school for deaf. 29x 9y (9y2) 20x 11y (11y8)	N=53 hearing children, 35x 9y (9y0) 32x 11y (11y2)	Told 6 stories describing negative emotion eliciting situations (e.g. trip to circus cancelled) – mix of more/less controllable. Asked how will character feel & why?

Appendix Table 6

Summary of studies examining emotional reactions and responses

Authors (date) Location	Experimenters	Deaf sample	Comparison Sample(s)	Methods
Hosie & Russell *et al* (2000) Aberdeen	2 experimenters for all, one qualified ToD experienced in all communication (familiar) – signed to deaf	N=27 prelingually profound –severe deaf from Total Communication school, 25 DH, 2DD 2 groups: N=13, age 12-17 (14y3) N=14, age 6y-10y (8y4)	N=26 hearing 2 groups: N=12, age 13-14y10 (14y5) N=14, age 8-8y10 (8y6)	12 stories depicting 3 emotions (happiness, fear and anger). Asked what they would do in the same situation – show/conceal emotion and why. Reasons coded into pro-social, self-protective, norm-maintenance & no justification.
Rieffe & Meerum Tergwogt (2006) Holland	Non-familiar staff member - transcription checked by deaf person	N= 21 prof deaf, sufficient SL, all entered school age 3-4, av IQ, DH (all parents but one use SL), 12 boys, age 11y3-12y10 (12y1) 9 girls, age 10y5-12y4 (11y4)	N=36 hearing 20 boys, age 9y8-12y10 (11y1) 16 girls, age 9y8-12y1 (11y1)	4 vignettes of anger-evoking conflict situations with peers
Suarez (2000) Canary Islands	Hearing experimenters used TC	N=18 severe (2) - profound (16) D (bilateral), elementary school (no SL provision), low level oral & SL ability rated by teachers, age 9y1-13y6.	N=18 hearing classmate's of D child & similar age – not friend/rejected by D peer.	20 hours program: 15 lessons for D only – interpersonal problem solving using a cognitive approach, using total communication. 6 x1hour social skills classes for both D & H. Pre-test & post-test : Meadow / Kendall Social-Emotional Assessment Inventory for Deaf Students (teacher rated). Children's' Assertive Behaviour Scale (teacher rating & self-rating). Cuestionario Sociometrico (peer rated).

Appendix C

Appendices to Research Report

1- *Mental State and Emotional Terms Identified in Transcripts*

Want, think, love, bored, confuse, enjoy, anticipating, expecting, wonder, decide, realise, hope, envy, know, unsure, uncertain, concern, questioning, listening, disagree, engage, consider, curious, like, understand, ignore, give attention, plan, reflect, learn, praying, checking, forgot, dreaming, notice, trust, regret, problem solving, toying with idea, judge, things going on in mind, playing on his mind, dilemma, trying to control, looking forwards to, empathise.

Sad, calm, fed up, relaxed, settled, jealous, depressed, agitated, worried, gutted, angry, frustrated, fearful, anxious, nervous, frightened, emotional, hurt, bothered, relieved, uncomfortable, excited, stern, mad, upset, tired, apprehensive, at ease, happy, justified, contentment, unrest, melancholic, brave, disappointed, annoyed, bad mood, alert, patient, remorseful, confident, stressed, serious, embarrassed, merry, suspicious, wound up, had enough, dominant, woeful, encouraged.

Feeling….: trapped, lonely, lost, sorry, under pressure, dejected, better, down, okay, in pain, unwell, good, left out, mixed up, powerful, lazy.

2 - *Themes from a content analysis of the Basic Emotion Recognition Test*

Original target emotion	Observed Frequency - Target	Observed Frequency - Alternative	Alternative response themes^	Chi-Squared (1d.f)
Happy 1	D: 8 H: 11	D: 4 H: 0	D: 3 forced smile	**4.439***
Afraid	D: 0 H: 2	D:12 H: 9	D: 8 negative shock, 2 startled H: 3 shock, 3 startled	2.390
Surprised 1	D: 6 H: 7	D: 6 H: 4	D: 2 shock, 2 bored	0.434
Disgusted	D: 5 H: 5	D: 7 H: 6	D: 3 angry, 3 unhappy H: 4 angry	0.034
Sad 1	D: 0 H: 2	D: 12 H: 9	D: 6 normal/ok, 3 daydreaming, 2 quiet H: 2 listening, 2 calm	2.390
Angry 1	D: 2 H: 3	D: 10 H: 8	D: 3 unhappy, 4 suspicious H: 2 suspicious, 3 questioning	0.379
Surprised 2	D: 11 H: 6	D: 1 H: 5	D: (nb: 9 positive, 2 negative) H: 2 delighted, 2 excited	**4.102***
Sad 2	D: 7 H: 7	D: 5 H: 4	D: 2 afraid H: 2 frustrated	0.068
Happy 2	D: 11 H: 9	D: 1 H: 2	D: (nb: 1 fake)	0.491
Angry 2	D: 8 H: 6	D: 3 H: 5	D: 2 puzzled	0.354
Scheming	D: 4 H: 4	D: 8 H: 7	D: 3 suspicious, 2 unsure H: 3 unsure	0.023
Guilt	D: 1 H: 0	D: 11 H:11	D: 3 avoiding, 3 frightened, 3 watching, 2 serious H: 6 frightened, 2 watching	0.958
Thoughtful	D: 6 H: 3	D: 6 H: 8	D: 2 fed up H: 5 fed up, 2 distracted	1.245
Admiring	D: 2 H: 1	D: 10 H: 10	D: 2 not interested H: 4 happy, 3 thoughtful	0.290
Quizzical	D: 1 H: 1	D: 11 H: 10	D: 2 suspicious, 2 uncomfortable, 2 stressed, 3 annoyed H: 2 revenge, 2 puzzled, 2 reproof, 2 thoughtful	0.004
Flirting	D: 1 H: 1	D: 11 D: 10	D: 5 happy, 3 proud, 2 ok H: 7 happy, 2 mischievous	0.004
Bored	D: 6 H: 6	D: 6 H: 5	D: 3 unhappy	0.048
Disinterested	D: 0 H: 0	D: 12 H: 11	D: 4 interested, 3 normal H: 3 interested, 3 inquiring	0.000
Interested	D: 2 H: 7	D: 10 H: 4	D: 2 hiding feelings, 2 happy	**5.316***
Arrogant	D: 1 H: 4	D: 11 H: 7	D: 3 can't be bothered H: 3 confrontational	2.650

*D = Deaf, H = Hearing, ^ Response themes only given if n>2 in each theme, * With 1df the critical value of χ^2 is 3.84 for p<.05.*

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