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Title: Mental state discourse between school-aged children with visual impairment and their mothers

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ABSTRACT

The study investigated mentalistic and descriptive discourse between school-aged children with visual impairment (VI) from birth, age 6-12 years, and their sighted mothers during joint book narrative (n=12), and in comparison to a group of sighted children of comparable age and verbal ability, and their mothers (n=14). The mothers of children with VI referred to the story characters' mental states and used descriptive elaborations to a greater extent than did the mothers of sighted children. The more mentalistic language the mothers of children with VI produced, the more mentalistic language was spoken by their children, although this was not independent of mothers' verbosity. The frequency of maternal elaborations, including their mentalistic language, was related the VI child's verbal cognition and socio-communicative competence. The findings offer an insight into nature and value of verbal scaffolding provided by mothers to their children with VI, shedding light on a potential candidate for future interventions.

Introduction

Much empirical evidence highlights the influence of socio-interactive input within a family context on children's social understanding (de Rosnay & Hughes, 2006; Carpendale & Lewis, 2004; Symons, 2004). An emphasis has been placed on the link between the mothers' conversational input, and their talk about internal mental states (e.g., emotions, beliefs and thoughts) in particular, and their children's 'theory of mind' development (Meins et al., 2003; Meins et al., 2002; Ruffman, Slade, & Crowe, 2002). Research has also shown that children progress through an orderly series of milestones within theory of mind acquisition (e.g., emotion before belief understanding) and language development (Peterson, Wellman, & Liu, 2005; Wellman & Liu, 2004). Taumoepeau and Ruffman (2006) argued that specific types of mental state language provided by mothers at these critical milestones scaffold children's mental state language and bootstrap their understanding of the mind.

A number of studies have demonstrated a direct link between maternal mental state language input and children's social understanding (Taumoepeau & Ruffman, 2006; de Rosnay, Pons, Harris, & Morrell, 2004; Meins et al., 2003; Meins et al., 2002; Ruffman et al., 2002; Meins, Fernyhough, Russell, & Clark-Carter, 1998). Evidence also suggest that this link is causal, with early mental state talk by mothers having a unique predictive value in children's theory of mind outcomes at different time-points in childhood, even when other potential mediators (i.e., mothers' educational levels and frequency of other types of utterances, and children's ages, language ability levels, own use of mentalistic language, and early theory of mind) are controlled for (Meins et al., 2003; Ruffman et al., 2002; Meins et al., 2002).

The positive relationship between mothers' mentalistic input and children's socio-cognitive outcomes has also been demonstrated with populations of children with known difficulties in

theory of mind development, namely children with autism (Slaughter, Peterson, & Mackintosh, 2007) and children with hearing impairment of hearing mothers (Moeller & Schick, 2006). To our knowledge, no studies to date have specifically examined maternal mentalistic language input to children with congenital and severe vision loss.

Similar to children with autism and late-signing children with hearing impairments, children with severe visual impairment (VI) from birth are also known to experience difficulties in their theory of mind development. As well as experiencing a delay in false-belief understanding (Roch-Levecq, 2006; Green, Pring, & Swettenham, 2004; Peterson, Peterson, & Webb, 2000; Minter, Hobson, & Bishop, 1998), their development has also frequently been associated with difficulties with emotional recognition, social interaction and social communication, including behavioural similarities to children with autism (Tadic, Pring, & Dale, 2010; Dyck, Farrugia, Shochet, & Holmes-Brown, 2004; Brown, Hobson, Lee, & Stevenson, 1997).

Studies examining early conversations and social interactions involving pre-school and often pre-lingual children with VI, and their mothers, have been instrumental in illuminating some early challenges that precede vulnerable outcomes in social communication and theory of mind in children with VI. Serious vision loss puts significant constraints on a young child who is learning that his/her experiences of objects can be shared with others (Bigelow, MacLean, & Proctor, 2004; Bigelow, 2003) and that his/her perspective may differ from that of the parent (Fraiberg, 1977). In turn, this leads to a differential parent-child interaction style, where the child's attention cannot be caught and directed by eye-contact, and the child's own opportunities for following the parent's focus of attention are seriously limited (Andersen, Dunlea, & Kekelis, 1993; Preisler, 1991). Thus, conversational interactions between young children with VI and their mothers have been described as asymmetrical; whilst mothers tend to initiate a greater proportion of almost exclusively child-centred topics than do their children with VI, these children - when compared to sighted children - rarely initiate conversations, are unable to sustain conversation around a

particular topic, or may be focussed on a topic that is different from that of the mother (Kekelis & Prinz, 1996; Moore & McConachie, 1994; Andersen et al., 1993; Dunlea, 1989; Kekelis & Andersen, 1984; Mills, 1983; Urwin, 1978). These studies have also shown that that mothers' language input to their young children with VI tends to be highly directive and controlling, involving relatively few descriptions (e.g., on the functions and attributes of objects, events and people) (Moore & McConachie, 1994; Andersen et al., 1993; Kekelis & Andersen, 1984), although these patterns may be exacerbated in children whose VI is of greater severity (Moore & McConachie, 1994).

In other studies, however, mothers' responsive behaviours were found to be positively related to the development of children with VI, with a high percentage of responses and compliances, and a low percentage of ignoring or refusing their children's initiations and requests for help (Hughes, Dote-Kwan, & Dolendo, 1999; Dote-Kwan, 1995). Some researchers have reported that mothers of children with VI speak more to their children, and use significantly more descriptions when directing the child, than do mothers of sighted children (Campbell, 2003; Pérez-Pereira & Conti-Ramsden, 2001; Behl, Akers, Boyce, & Taylor, 1996). This supports the idea that parents of children with VI are able to develop alternative strategies when conversing with their children and exploit the use of language as a way to share the world with them (Pérez-Pereira & Conti-Ramsden, 1999; Urwin, 1978).

Despite some conflicting evidence concerning the early mother-child interactions that involve children with VI, general consensus is that maternal language input to their children who are visually impaired is qualitatively different from that received by sighted children. Yet, very little is know about discourse between children with VI and their mothers between beyond the first four years of life. The aim of this study was to investigate whether the difference in the quality of language input is also seen at school age and whether it is reflected at the level of maternal mentalistic language use.

Children with a significant vision loss from birth are a rare heterogeneous population, and methodological constraints on research studies involving such children are significant and complex. It is, therefore, not surprising that many previous studies with young children with VI included children with additional non-sensory and intellectual impairments, and have been carried out with very small samples, often only individual cases, and generally lacked control groups. Thus, we made careful attempts to focus on children with VI with verbal intelligence in the normal range, and also utilised a comparison group of sighted children of similar age and verbal ability, and their mothers.

The book-sharing narrative has been shown to be an attractive and valid method for assessing mother-child dialogue (Slaughter et al., 2007; Symons, Peterson, Slaughter, Roche, & Doyle, 2005), as it provides a naturalistic setting and an opportunity to elaborate and ask questions by both conversational partners, including conversation about the story characters' thoughts and feelings (Symons et al., 2005; Dyer, Shatz, & Wellman, 2000). We felt that a story-book narrative using an unfamiliar book would provide a suitable context within which to examine the incidence and nature of language input to children with VI, particularly as it is not solely vision-dependent like other available paradigms (Ruffman et al., 2002). It also allows the mother-child discourse, when examined across a wider group of participants, to be anchored in the same topic, providing a standardised methodology. Although this method had been previously applied mainly with young children, the advantage of examining mother-child discourse with school-age children is that the vocabularies of older children contain a wider repertoire of mental state terms and the quality of maternal mentalistic talk is likely to reflect this (Taumoepeau & Ruffman, 2006).

Because in the present study we focused on school-aged children whose verbal intelligence is in the normal ranges, we did not examine their theory of mind performance. Despite the initial

theory of mind delays experienced by many children with VI, good verbal ability (in terms of verbal IQ) has been seen as playing an important role. For instance, children with VI who do not show theory of mind delay generally have higher verbal IQs than their visually impaired peers with lower verbal IQ level, and many children with VI who initially fail false-belief tasks seem to 'catch up' with their sighted peers in their school age, as their language becomes more proficient (Green et al., 2004). Consequently, standard theory of mind assessment may not be sensitive to difficulties social understanding at school age in children with VI whose language ability is advanced. Autism research suggests that difficulties in social understanding may be more apparent in real-life situations, as these may involve more subtle aspects of theory of mind, such as appropriate use of pragmatic language and social overtures (e.g., applying conversational rules such as initiating, responding and turn-taking, maintaining meaningful conversations, and keeping track of speaker's and listener's mental states) (Dennis, Lazenby, & Lockyer, 2001; Capps, Losh, & Thurber, 2000; Capps, Kehres, & Sigman, 1998). Thus, we included parental reports of children's every-day social interactive and communicative behaviours.

Overall, the study examined whether the mothers of school aged children with VI and mothers of sighted children would differ in the extent to which they referred to internal mental states during a joint book-reading session with their children. Non-mentalistic (i.e., descriptive) features of the mothers' discourse and the relationship between the language characteristics of mothers and children in the two groups were also examined. Finally, the study investigated whether the characteristics of mother-child discourse were influenced by the VI child's own cognitive and socio-communicative competence.

Method

Participants

The participants were 12 children with congenital VI and 14 sighted children. In addition to sample description below, participant recruitment selection and procedure are described in detail elsewhere (Tadic et al., 2010).

The children with congenital VI (identified through the Developmental Vision Clinic at the Great Ormond Street Hospital, London, UK, which they attended in their early years) all had a significant congenital vision loss (i.e., profound - no form vision, light perception or worse; or severe - severely degraded form vision) of peripheral, rather than cerebral, origin (see Sonksen & Dale, 2002). Of 20 children for whom informed parental consent was obtained, 12 children who were age 6-12 years at the time of the study, who had no additional impairments, and for whom English was the main language spoken with their mother, were eligible for inclusion in this study. All but one were Braille readers at the time of this study. Their visual diagnoses were Lebers amaurosis (n=3), microphthalmia (n=3), aniridia with glaucoma (n=1), bilateral optic hypoplasia (n=2), persistent primary hyperplastic vitreous (1), familial exudative vitreo-retinopathy (n=1), multiple opacities and sclerocornea (1).

Informed parental consent for the study was obtained for 17 sighted children recruited through local primary schools. Two children were excluded initially to facilitate group matching, and one was excluded subsequently, her mother being identified as an outlier. Thus, the comparison group consisted of 14 normally sighted children most closely resembling the VI group in terms of age and verbal IQ.

The two groups were comparable in terms of their VIQ ($t_{(24)}$=.933, p=.360), verbal mental age (VMA) ($t_{(24)}$=.376, p=.710), chronological age ($t_{(24)}$=.051, p=.960) and gender ($\chi^2_{(1)=}$.004, p=.951)

(Table 1). The small sample size provided a limited opportunity to statistically examine the impact of other socio-demographic variables, which empirically have been found to be related to the levels of mothers' and children's mentalistic language (e.g., child's ethnicity, birth order, number of siblings and maternal education level). Thus, we ensured that the two groups were similar with respect to these variables (Table 1).

(Table 1)

Materials and procedure

Book-sharing narrative

An illustrated children's book 'First Day Jitters' (Dannenberg, 2000), adopted from Symons et al. (2005), was used for the mother-child book-reading session. The book depicts a character dealing with the anxiety about the first day of school. It permits a discussion about the internal mental states, as the main theme in the story involves a case of mistaken identity revealed at the end of the book.

All of the participating dyads confirmed they were unfamiliar with the book. They were all seen at home by the first author, where they were asked to spend some time reading the book in the manner that was most typical for them. They were told that the researcher wished to obtain an insight into the language used between children and parents in a real-life situation and were asked to discuss the book content as they would usually do so, for example before bedtime or when looking at magazines. The parents were reassured that they would not be judged on their reading skills and that the researcher was only interested in the way the dyads talked to each other in a naturalistic setting. The researcher left the room during the book narrative in order to reduce the audience effect. The sessions took 7 minutes on average and were audio recorded.

While the book reading in the VI sample was carried out by the parents, in the sighted group the book reading was shared between the children and their parents and, in a couple of cases, it was carried out by the children themselves. However, in both groups the discussion about the story events and characteristics was facilitated by the parents.

Scoring of the narrative data

All the speech produced by mother-child dyads was tape-recorded and transcribed. The language that was not directly from the book was coded. First, the number of utterances that were relevant to the book's content was derived for parents and children respectively. An utterance was defined as a word or string of words identified by a pause or grammatical completeness (Symons et al., 2005). Then, for each partner, their utterances were examined and coded for the type of elaboration they contained. Although in most cases the number of utterances equalled the number of elaborations ($r = .998$), a distinction was made between the two because it was possible for one utterance to contain more than one elaboration.

The elaborations were classified broadly as *mentalistic* and *non-mentalistic. Mentalistic* elaborations were coded following the criteria for mental state language by Ruffman et al. (2002) and Bartsch and Wellman (1995) (Table 2). This included references to desires (e.g., '*She doesn't want to get up.*'), emotions (e.g., '*She seems quite scared.*'), modulations of assertion (e.g., '*I wonder why she's hiding.*'), think and know terms (e.g., '*They're thinking hard*', excluding 'I don't know' responses because of their possible use to mean simply 'I can't answer') and other mental states (e.g. '*Do you remember your first day at school?*').

(Table 2)

We did not examine these different types of mental states (Table 2). Instead, *mentalistic* elaborations were classified as those referring i) to *self* (e.g., '*I don't remember seeing that*'), ii) to

partner (i.e., *mother or child*) (e.g., *'What do you think about this book?'*), iii) to *character* (e.g., *'She thinks it's horrible'*) and iv) *other* - less specific -mental state references (e.g., *'It's a mind trick'; 'It's an idea.'*). If two different mentalistic elaborations were produced in one utterance (e.g., *'I think she's scared.'*), the responses were then assigned to both categories (e.g., *'I think' = self mentalistic*; and *'She's scared' = character mentalistic*).

Non-mentalistic elaborations were classified as *descriptive* and *general*, following the categories specified by Symons et al. (2005). *Descriptive* elaborations involved language referring to behavioural and physical aspects of the story and the book (e.g., *'the girl has brown hair'; 'the doggy is barking'*). *General* elaborations were all the other utterances that did not add descriptive value to the book-reading discourse (e.g., *'What's that?'*, *'Oh, no!'*, *'Let's continue'*, etc). On their own, *general* elaborations were not examined statistically. Where utterances contained different types of elaboration (e.g., *'do you think her heart is beating fast or slow?'*), the elaborations were assigned to both *mentalistic* and *descriptive* elaboration category.

Each child and mother received a score for *mentalistic* and *descriptive* elaborations, expressed as a proportion of all elaborations (e.g., proportion *mentalistic* = total number of *mentalistic* / [sum of all elaborations: *mentalistic* + *descriptive* + *general]*). The proportional data were considered more appropriate than frequency data as they were independent of mothers' verbosity. The scores for each type of mentalistic reference (for children and mothers respectively) were expressed as proportions of all mental state elaborations (e.g., proportion of *self mentalistic* = number of *self mentalistic* / [total number of *mentalistic: character* + *self* + *partner* + *other]*). Individually, all but *other mentalistic* references were considered for subsequent analyses.

An independent rater, who was unaware of the children's characteristics or the hypotheses of the study, coded approximately 50% of randomly selected transcripts from each group, resulting in

high reliability correlations overall (Mother Mentalistic: r=.990; Mother Descriptive: r= .929; Child Mentalistic: r=.889; Child Descriptive: r=.821).

Measures of verbal ability and socio-communicative competence

The Verbal Scale from the Wechsler Intelligence Scales for Children-III (WISC-III) (Wechsler, 1992) was used to assess verbal ability. Each child's VIQ and VMA were derived from five verbal subtests that do not require presentation of visual stimuli, and were thus suitable for use with children with VI: Information, Similarities, Vocabulary, Comprehension and Digit Span.

Children's socio-communicative competence was assessed using the Children's Communication Checklist-2 (CCC-2) (Bishop, 2003) and the Social Communication Questionnaire (SCQ) (Rutter, Bailey, & Lord, 2003).

The CCC-2 is a parent-report based questionnaire used to assess every-day language, communicative and socio-interactive skills across 10 different subscales. Whilst not diagnostic, it can be used in screening for a potential communication conditions (e.g., ASC and specific language impairment-SLI). For the purposes of this study two CCC-2 indices were (see Philofsky, Fidler, & Hepburn, 2007). Firstly, to assess the use of language for social purpose, pragmatic language composite – CCC-2 PRAG - based on the sum of 4 CCC-2 scales assessing Context, Stereotyped Language, Non-Verbal Communication and Appropriate Initiation was derived. Secondly, to obtain a measure of social interaction skills, a social interaction composite – CCC-2 SOC - based on the sum of 2 CCC-2 scales assessing Social Relationships and Interests was derived. The higher the CCC-2 PRAG and the CCC2 SOC scores, the higher the child's competence in pragmatic language use and social interaction respectively.

The SCQ is a parent-completed questionnaire used to screen for socio-communicative behaviours associated with ASC, and which map onto the three core diagnostic domains:

Reciprocal Social Interaction, Communication and the Restricted, Repetitive and Stereotyped Behaviours. The raw total SCQ score was used as a measure of socio-communicative competence (i.e., the higher the score, the lower the socio-communicative outcome).

Ethical approval

The study was approved by the National Health Service medical research ethical committee for the UCL Institute of Child Health and Great Ormond Street Hospital, and the research ethical committee for Goldsmiths, University of London, London, UK.

Results

Screening of the child discourse data showed one outlier in the VI group on mental states elaborations only. This child produced only one utterance containing a single mentalistic elaboration, resulting in the maximum mentalistic proportion score. The results we report below remain the same with this child being removed from the analyses. The maternal discourse data were normally distributed.

Corrected statistics were used where variances differed significantly between the groups. Corrections for multiple comparisons were not applied because, given the small sample size, there were a risk that, due to lack of statistical power, a true effect would potentially be disregarded. Instead, effect size estimates have been reported to support the results where $p>.01$. Cohen's conventions for the estimates of effect size *'d'* have been adopted as follows: Small - $d=.20$; Medium - $d=.50$; and Large - $d=.80$ (Cohen, 1994).

Between-group comparisons

Table 3 shows the mean raw and proportion scores of all, mental state and descriptive elaborations for children and mothers in each group. Non-mentalistic elaborations made up the largest proportion of the dyad's language. In both groups, approximately a third of all the elaborations spoken by the mothers were those referring to mental states, compared to approximately 13% of elaborations spoken by the children.

(Table 3)

The mothers of children with VI produced significantly more elaborations overall than the mothers of sighted children ($t_{(14.1)}=3.035$, $p=.009$). The overall number of child elaborations was not significantly different between the two groups ($t_{(15.8)}=1.427$, $p=.173$, $d=.57$). There was no

significant between-group difference in the proportions of mentalistic language spoken by children ($t_{(24)}$=.284, p=.779, d=.09) or mothers ($t_{(24)}$= -1.549, p=.134, d= -.56). The sighted children's language contained significantly more descriptive elaborations than did the language of children with VI ($t_{(24)}$= -2.344, p=.028, d= -.90). The language of mothers of children with VI contained significantly more descriptive elaborations about the book than did the language of mothers of sighted children ($t_{(24)}$=3.079, p=.005). A qualitative data example (1) is used to illustrate this pattern of results. Here, raw data were sampled from conversations of two dyads - one from each group - using the same book section. The emphasis is on descriptive language produced by a mother of a child with VI (on the left), and the descriptive language spoken by a sighted child (on the right) (the text highlighted in bold is directly from the book).

(1) A 9 year old boy with VI:

I hate my new school, "Sarah said. She tunnelled down to the end of her bed.

Mother: What does tunnelled down mean?
Child: I don't know.
Mother: She buried herself under the bed, hoping that her dad won't make her get out of bed. The cat's licking his paw on top of, I think, Sarah's bottom. 'Cause he's sitting on Sarah's duvet, and the father's got his hand on his head and he's thinking: 'Oh, my goodness'. And then he says:

"How can you hate your new school, sweetheart?"

A 7 year old sighted girl:

I hate my new school, "Sarah said. She tunnelled down to the end of her bed.

Mother: I still haven't seen Sarah, where is she?
Child: There's her bed, and there's her pyjamas, and there's a big lump where she is…
Mother: I still don't know what she looks like, do you?
Child: Just keep going so we can find out.
Mother: OK, let's see. The cat is so cute, isn't it?
Child: It looks more like a bird to me.

Table 3 also shows the proportions of mothers' references to their own mental states (to Self), to the mental states of their child (to Child), and the mental states of the story characters (to Character) for each group. At least 40% of all mentalistic elaborations produced by mothers in both groups were those reffering to their child's mental state. However, the two groups did not

differ in terms of the proportions of mothers' child-minded mentalistic language (to Child: $t_{(17.4)}$= -1.537, p= .142, d= -.62), and the extent to which the mothers referred to their own mental states (to Self: $t_{(23)}$= .649, p= .523, d= .25). However, the proportions of references to the mental states of the story characters were significantly higher in the mothers of children with VI than the mothers of sighted children (to Character: $t_{(14.6)}$= 2.241, p= .041, d= .81).

Children generally elaborated less on the book content than did their mothers, resulting in fewer data points overall. The proportion scores of mentalistic language referring to Self, to Mother and to Character could only be calculated for 8 children in VI group and for 11 children in the sighted group, as some children did not produce any mentalistic language, thus further analyses with respect to these variables were not considered meaningful.

Relationship between mothers' and children's elaborations

For correlational analyses, due to the limitations of child proportional data, we reverted to the raw numbers and used non-parametric Spearman rho (ϱ) coefficients (Table 4).

(Table 4)

The pattern of correlations in Table 4 suggests that the quantity of children's discourse was directly related to the extent to which the mothers elaborated on the book content. More specifically, in each group the total number of elaborations produced by mothers and that produced by children were significantly correlated (VI: ϱ=.796, p=.002; Sighted: ϱ=.696, p=.006). There was also a highly significant positive correlation between the VI children's mentalistic language and mentalistic language of their mothers (ϱ=.862, p≤.001), although this correlation failed to reach statistical significance in the sighted group (ϱ=.416, p=.139). A qualitative data example (2) of language exchange between a 7 year old girl with profound VI and her mother is used to illustrate these results, and more specifically, how maternal mentalistic language input

may scaffold mentalistic language use of their children with VI (the text highlighted in bold is directly from the book).

(2)   **'They walked to the car. Sarah's hands were cold and clammy'**…

Mother: Why do you think that could be?

Child: I don't know.

Mother: Well, what makes your hands go cold and clammy? Can you think?

Child: When you're sick!

Mother: When you're sick, yeah. What else?

Child: I've no idea.

Mother: No idea? Do you ever get cold and clammy hands when you feel a bit nervous?

Child: Yeah!

Mother: Now, there you go.

Child: I felt well nervous…

Mother: When?

Child: When I went to that music thing, oh, my…

Relationship with developmental level and socio-communicative competence

<u>VI group:</u> The overall use of mentalistic language spoken by dyads during the book narrative appeared to be related to the children's developmental levels. More specifically, there were significant correlations between the children's VIQ levels, as measured by the WISC-III, and the number of mentalistic elaborations produced by children ($\varrho=.612$, $p=.035$) and those produced by mothers ($\varrho=.585$, $p=.046$). There were no significant correlations between the total number of elaborations and VIQ (Child: $\varrho=.262$, $p=.414$; Mother: $\varrho=.459$, $p=.134$). The children's chronological ages negatively and significantly correlated with a) the number of mentalistic and all elaborations spoken by the child ($\varrho= -.588$, $p=.044$; $\varrho= -.812$, $p=.001$), and b) the number of mentalistic and all elaborations spoken by the mother ($\varrho= -.666$, $p=.018$; $\varrho= -.571$, $p=.053$).

Significantly lower outcomes on the SCQ and the CCC-2 assessment in the same group of children with VI, in relation to a larger comparison group of sighted children was reported

elsewhere (Tadic et al., 2010), so these analyses are not repeated in this study. Here, there was a significant positive correlation between the children's pragmatic language competence, as measured by the CCC-2 PRAG, and the maternal language input in terms of their a) total number of all elaborations (ϱ=.629, p=.038), and b) number of mentalistic elaborations (ϱ=.633, p=.036). The children's social competence, as measured by the CCC-2 SOC, correlated significantly with the total number of elaborations spoken by children (ϱ=.755, p=.007) and mothers (ϱ=.687, p=.02). The correlation between the total number of elaborations spoken by children and their mothers did not correlate significantly with the SCQ scores (Child: ϱ=-.171, p=.594; Mother: ϱ=-.137, p=.670).

Sighted group: There were no statistically significant correlations between mother-child language components (the number of mentalistic and all elaborations) and the children's verbal (VIQ) and socio-communicative competence (CCC PRAG, CCC SOC and SCQ) (p values range .137-.979).

Discussion

The present findings demonstrate that the language provided to school-aged children who are born with VI in the context of a joint book-reading session with their mothers is qualitatively different from that received by sighted children. Mothers of children with VI in this study elaborated more than mothers of sighted children overall, and these elaborations consisted of significantly more descriptive information than the elaborations provided by mothers of sighted children. However, whilst mothers of children with VI may have provided a similar quantity of mental state talk as mothers of sighted children, their mentalistic language consisted of significantly more references to the mental states of the story characters than the language of mothers of children who are sighted.

Approximately one third of all elaborations produced by mothers in both groups were about mental states. Symons et al. (2005) reported a similar proportion (i.e., 28%) of mentalistic language within the overall discourse produced by mothers during joint book-reading with their 5-7 year old children (using the same story-book as here). Thus, the extent to which mothers elaborate on mental states may be a feature that is inherent in the language that they direct to their children in general – at least in the context of joint book-reading behaviours - and the current findings suggest that this aspect of mothers' language contribution to their child's learning may be unaffected by their child's sensory deficit.

At least 40% of all maternal mentalistic elaborations in both groups referred to the child's mental state, implying that mothers in general may be particularly sensitive towards their child's subjective beliefs, desires and emotions (Meins et al., 2003). The finding that the mothers of children with VI referred to the story characters' mental states more than did the mothers of sighted children may illustrate an additional sensitivity of mothers whose children have a visual loss. These mothers may be naturally prone to highlighting to their child important details of the

social world (e.g., what other people are feeling or thinking), which they otherwise may find difficult to access, and which sighted children may obtain spontaneously through vision (e.g., by observing facial expressions and gestures).

This finding may be of particular significance given the well documented vulnerabilities in theory of mind development of children with VI (Green et al., 2004; Peterson et al., 2000). Although the study did not investigate the children's theory of mind outcomes or the causal nature of the mother-child language relationship, it is possible that maternal descriptions of and references to other people's emotional and cognitive states may provide scaffolding on which children with VI explicitly build their mentalistic vocabulary and understanding of others. The given qualitative example of a mother-child conversation that involves a 7 year old girl with profound vision loss from birth provides a real-life illustration of how such scaffolding may take place. Here, the mother gradually prompts the child to relate the character's physiological state (i.e., cold and clammy hands) with the child's own experiences of that state and an associated mental state (i.e., feeling nervous), which culminates in the child placing her understanding of this mental state into the context of her own experiences. This type of discourse and interaction is likely to occur also for sighted children (e.g., Ruffman et al., 2002), but it may be instrumental in a visually impaired child's understanding of why other people may feel and behave a certain way (i.e., theory of mind).

Further insight into the role of maternal language scaffolding comes from the quality of descriptions of people, objects and events provided by mothers of children with VI. Although sighted children elaborated on the descriptive aspects of the story-book to a greater extent than did the children with VI, children with VI may produce fewer descriptive elaborations because the information upon which to base such elaborations is not available to them and, instead, they rely heavily upon their parents' input. The descriptive nature of the language of mothers of children with VI does seem to reinforce the notion that such mothers are able to adopt

alternative strategies in order to bring the external events closer to the experiences of their child, and this is likely to be facilitative of their child's development (Pérez-Pereira & Conti-Ramsden, 1999; Urwin, 1978). The present findings may be particularly meaningful, given some evidence of impoverished descriptive language input to such children in the early years (Kekelis & Andersen, 1984; Moore & McConachie, 1994). Longitudinal studies are needed to understand the long-term mechanisms by which the early maternal input may allow the visually impaired child's own vocabulary to unfold, and how in turn the child's own expanding vocabulary may boost maternal language input to the child.

The data on children's own mentalistic language were limited. Thus, it is uncertain to what extent the mothers' mentalistic language was influenced by the children's own level of mental state understanding, particularly as. However, the study included measures of children's pragmatic language (e.g., appropriate use of language for social and communicative purpose) and social interaction (e.g., social relationships and interests), the experience of, and competencies in which, have been linked to theory of mind development (Astington & Baird, 2005; Carpendale & Lewis, 2004; Eisenmajer & Prior, 1991). Difficulties with pragmatic language use and socio-communicative competence in the same group of children, compared to a larger group sighted controls of similar age and verbal intelligence, have been described elsewhere (Tadic et al., 2010). In the present investigation, we found that the mothers of children with VI who were rated as having higher pragmatic language and social interaction competence on a parental questionnaire showed a greater proclivity to elaborate on the book content, including mentalistic language. Whilst we cannot infer causality between maternal language input and the visually impaired child's competence in pragmatic language use and social interaction, these findings raise may shed some light on the presentation of autistic-like presentation in children with VI (Tadic et al., 2010; Hobson & Bishop, 2003; Brown et al., 1997), and raise an interesting question for future studies: Does the nature of maternal language input mediate autistic-like presentation in children who are born with severe vision loss?

The present findings showed that the level of maternal language input to children with VI - as well as the children's own mentalistic language output - was related to the child's verbal IQ. Additionally, the quantity of mother-child discourse was inversely related to chronological age. This correlational pattern of results suggests that the task may have been biased towards younger children with higher levels of verbal ability. It is also possible that the level of available functional vision in children with a severe, but not total, sight loss in our study (N=7), would have contributed to some variation within the VI group. However, our observations of individual children with differing levels of VI did not reveal a meaningful differential pattern and the mothers of children with VI were a homogeneous group in comparison to the mothers of sighted children. All of the children with VI we assessed, had a significant vision loss from birth. Although the some available functional form vision, albeit severely degraded, could have allowed some children with VI to detected colours and general contours of larger shapes in the book illustrations, it is likely that descriptions of the characters' facial expressions, their intentions denoted by the eye-gaze, and many individual details of the characters' surroundings would have been dependent on the parental observations. Nevertheless, there are implications for future studies that may examine potential qualitative differences across different ages and vision levels in children with VI more systematically.

Although the strengths of the book-sharing context had been identified previously (Dyer et al., 2000; Symons et al., 2005), the paradigm prevented us from drawing conclusions regarding the children's own mentalistic discourse. One reason for the reduced output by children in this study is that the children were too old for the task, and this is consistent with the reported negative correlations with chronological age. Furthermore, the nature of the task may have required all the children, particularly those with VI, to be passive by default, despite their good verbal skills. The reduced verbal contribution by the child would have affected, at least to some extent, the level and nature of parental involvement. To strengthen the methodology, future studies would

benefit from a different context for examining the mother-child mentalistic discourse. The existing paradigms (e.g., Ruffman et al., 2002) could be adapted to be more suitable for use with older children. Instead of pictorial stimuli, the parent could be provided with a set of topics (e.g., about friends) and encouraged to facilitate a discussion with their child, improving the ecological validity of the assessment. Finally, such methodologies could also be suitably adapted to examine conversational interactions, and mentalistic language exchange, between children with VI and their siblings and friends (see Marschark, Green, Hindmarsh, & Walker, 2000; Hughes & Dunn, 1997; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991).

Despite the methodological limitations of the study, assessing the characteristics of mother-child discourse during a book narrative has thrown a positive light on the mother-child relationship that involves children with VI, at least in case of school-aged children who are verbally and cognitively proficient. Whilst the constraints that visual impairment may impose upon this relationship may be present in the early years (Moore & McConachie, 1994; Andersen et al., 1993), the current findings suggest that maternal input to children with VI may receive a positive boost given a suitable context. Thus, the mothers' verbal involvement overall, including their mentalistic talk, may be a strength that can be capitalised on when considering developmental intervention strategies, and advice and guidance for parents of young children with VI. Such intervention could include parent training programmes where certain aspects of mother-child conversational interaction could be encouraged explicitly (e.g., verbal emphasis on emotional expressions of other people in real-life situations that the visually impaired child regularly encounters, such as a shopping trip). Implementing and evaluating such interventions at critical points in development (Taumoepeau & Ruffman, 2008; 2006), that is, at approximate ages that see emergence of milestones in language and social understanding (such as joint attention, emergence of symbolic language and play) may be particularly important for children with VI, interceding potential socio-cognitive difficulties and facilitating their social outcomes long term.

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TABLES

Table 1: Demographic characteristics of the sample

	VI *N = 12*	*Sighted* *N = 14*	*p value*
Verbal IQ (VIQ)			
Mean (SD)	109 (9.2)	105.5 (8.9)	n.s
Range	95 – 128	92 – 121	
Verbal Mental Age (VMA)			
Mean (SD) in months	109. 3 (24.3)	106 (20.7)	n.s.
Range	7:02 – 12:10	5:11 – 11:10	
Age			
Mean (SD) in months	101 (24.4)	100.6 (19.6)	n.s.
Range in years	6:06 – 12:11	6:02 - 11:08	
Gender			
Female	58%	57%	n.s.
Ethnicity			
White British	66.7 %	71.4 %	-
Black British	8.3%	7.1%	
Asian	8.3%	7.1%	
Mixed	16.7%	14.3%	
Number of siblings			
None	17 %	7 %	-
Birth order			
First child	42 %	36 %	-
Mother's education level			
Further education (e.g., post A-level)	60%	54%	-

education

Table 2: Examples of mental state words

Category	*Examples*
Desires	Want, like, love, hope, wish, dream, prefer, keen on
Emotions	Happy, sad, feel, cross, angry, grumpy
Modulations of assertion	Sure, guess, figure, reckon, certain, suppose, wonder, expect
Think and know	Know, think
Other mental states	Remember, understand, forget

Table 3: The mean raw and proportion scores for mentalistic and descriptive elaborations for children and mothers in each group

Elaborations	Mean(SD)	VI	Sighted	p value
Mother				
All elaborations	Raw	75.3 (48.4)	30.1 (19.5)	**
	Range	13-159	1-68	
Mentalistic	Raw	18.7 (13.11)	10.5 (7)	
	Range	2-47	0-27	
	Proportion	.27 (.11)	.34 (.13)	n. s.
- To Self	Raw	4.1 (4.1)	1.9 (1.7) [a]	
	Range	0-12	0-5	
	Proportion	.19 (.11)	.16 (.12)	n. s.
- To Child	Raw	6.6 (5.9)	5.4 (3.4)	
	Range	0-19	0-13	
	Proportion	.40 (.31)	.56 (.18)	n. s.
- To Character	Raw	5.5 (4.6)	1.6 (1.6)	
	Range	0-14	0-6	
	Proportion	.27 (.20)	.14 (.10)	*
Descriptive	Raw	39 (26.1)	9.1 (6.7)	
	Range	1-76	0-22	

Proportion		.49 (.20)	.27 (.16)	**

Child

All elaborations	Raw	24.8 (21.8)	14.8 (11.2)	n.s
	Range	1-56	3-38	
Mentalistic [b]	Raw	3 (3.7)	2.2 (2.9)	
	Range	0-11	0-10	
	Proportion	.15 (.28)	.13 (.13)	n. s.
Descriptive	Raw	6.1 (6.9)	4.1 (3.2)	
	Range	0-19	1-11	
	Proportion	.17 (.15)	.32 (.17)	*

n.s.–not significant; *-significant at $p \leq .05$; **-significant at $p \leq .01$

[a] N missing=1; One mother in the sighted group did not produce any mentalistic elaborations.

[b] The child data were limited with respect to the different types of mentalistic elaborations, and were not included in the table.

Table 4: Spearman's correlation coefficients between mother-child discourse components, and the children's age, VIQ and socio-communication outcomes

	VI group				Sighted group			
	Child mentalistic elaborations	*Child all elaborations*	*Mother mentalistic elaborations*	*Mother all elaborations*	*Child mentalistic elaborations*	*Child all elaborations*	*Mother mentalistic elaborations*	*Mother all elaborations*
Child mentalistic elaborations		.789**	.862**	.772**		.592*	.416	.349
Child all elaborations			.832**	.796**			.684**	.696**
Age in months	-588*	-.812**	-.666*	-.571*				
WISC – III VIQ	.612*		.585*					
CCC - 2 PRAG			.633*	.629*				
CCC - 2 SOC		.755**		.687*				
SCQ								

*-significant at *p*≤.05; **-significant at *p*≤.01