THE CONTEXT OF COMMUNICATION: FACTORS AFFECTING EARLY LANGUAGE, INTERACTION AND SOCIOEMOTIONAL DEVELOPMENT

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Abstract

This thesis focused on two studies designed to investigate the influence of communicative context on parent-child interactions. Study 1 looked at the effects of different communication intervention systems (Baby Sign (BS), Enhanced Verbal (EV), and Enhanced Nonverbal (ENV) techniques) on language acquisition, nonverbal behaviours, and socio-emotional development. Study 2 measured the effects of chronic otitis media with effusion (OME) on interactions between parent and child. The investigative platform for both studies was to ascertain how the environment in which parent-infant interactions occur may be affected positively by the enhancement of communication and/or negatively by constitutional conditions (such as OME).

Study 1 compared BS to other types of intervention. Typically-developing infants were recruited between the ages of 9-11 months and followed longitudinally for 20 months. BS was chosen due to its claims of advancement in IQ rates, symbolic development, complex language acquisition and development, as well as self-esteem (for example, www.babysigns.com). Using the MacArthur Bates Communicative Development Inventories (MCDIs) results showed that infants in all the intervention groups (at around 14 months of age) evidenced early language comprehension benefits (for phrases). BS also appeared to have an effect on single word comprehension. This may be a temporary advancement. No single group showed specifically enhanced benefits for language production over the others. Equally, there were no significant differences between the groups for the *type* of emerging lexicon. By 24 months the BS group evidenced a significant improvement in socioemotional development not evident in other groups, although the mechanism behind this was unclear. It was concluded that effects of BS on language development were restricted to early

improvements in comprehension; and that these benefits may impact on subsequent socio-emotional development especially around the 24 month age. This impact was not evident in the other intervention groups or in the non-intervention control.

This study has added to previous literature on BS by embedding the technique in context (taking into consideration the full communicative environment, verbal and nonverbal behaviours of parent and infant; and related areas of development, such as attachment and socioemotional changes). This is important as there are many pressures on parents to optimise their infant's development and specific methods may be marketed as better than others. Findings here suggest that the quality of the interaction rather than the mode may be the key ingredient, although there are still questions regarding the effects of BS on socioemotional development.

Study 2 measured the effects of chronic otitis media with effusion (OME) on interactions between parent and child and how OME impacted on the parent's quality of life. OME is often asymptomatic; therefore parents can be unaware of the condition's effects. Previous studies have tended to focus on the full OM spectrum and its effects on language development. Some, however, have shown that behavioural problems can result from persistent episodes of chronic OME (Maw *et al*., 1999) although many of these studies investigated older children, targeted attention as a behavioural measure, or included aspects such as reading ability as a behavioural outcome. This thesis explored the impact of OME on communicative style through the comparison of three groups: Group 1 - children with chronic OME; Group 2 - children with chronic throat and nose conditions; and Group 3 a non-medical control. Data for Groups 1 and 2 were collected during single appointments and

involved dyads sourced from two ENT outpatient departments. Children were between the ages of 17-47 months.

Results showed significant differences between the OME group and the other two for nonverbal and socioemotional behaviours. During parent-child play interactions, OME children glanced (with rapid, short glances) towards the parent more often than children in the other groups. One interpretation of this is that children with chronic OME persist in active triadic attention strategies whilst other children locate the topic of reference from the speech signal alone.

Secondly, parents of children with OME raised significantly more concerns regarding their child's socio-emotional development – especially in interacting with others - than parents in the other 2 groups. They also reported more family tension and arguments than in the non-OME ENT group. This suggests that experiencing chronic OME and its associated periods of hearing loss has either a direct or indirect detrimental impact on a child's socioemotional wellbeing. This may relate to similar socioemotional difficulties reported in children with different types of communication problems e.g. late talkers (van Balkom et al, 2010). These concerns however were not reflected in the Parental QoL Questionnaire - used with the two medical groups. Findings imply the Ages and Stages Questionnaire: Socioemotional (AQS: SE) may be a more accurate measure for assessing parental concerns regarding socioemotional behaviour.

Study 2 adds to previous research into the socioemotional development of children with OME by showing that nonverbal and pragmatic skills can be altered by the condition and

thereby can affect the communicative context of parent-infant interaction. More research in this area is implicated.

Table of Contents

7

List of Tables

List of Figures

14

List of Appendices

Appendix 1: Parental Background Questionnaire

Appendix 2: Vocabulary grid

Appendix 3a: DVD of BS signs

Appendix 3b: Index for DVD of BS signs

Appendix 4a: Index for folder of BS photographic stills

Appendix 4b: Cover sheets for each section of BS photographic stills

Appendix 4c: BS photographic stills for 'My Family'

Appendix 4d: BS photographic stills for 'Pets'

Appendix 4e: BS photographic stills for 'Getting Ready'

Appendix 4f: BS photographic stills for 'Clothes'

Appendix 4g: BS photographic stills for 'Activities'

Appendix 4h: BS photographic stills for 'Doing words'

Appendix 4i: BS photographic stills for 'Descriptions'

Appendix 4j: BS photographic stills for 'Food'

Appendix 4k: BS photographic stills for 'Places'

Appendix 4l: BS photographic stills for 'Other People'

Appendix 4m: BS photographic stills for 'Other Animals'

Appendix 4n: BS photographic stills for 'Colours'

Appendix 5: Definition of 'Parentese'/IDS for EV Group

Appendix 6a: Definition of Intentionality Model for ENV Group

Appendix 6b: Examples of ENV Activities

Appendix 7a: Teaching Protocols – Training Plans (for Researcher only)

Appendix 7b: Teaching Protocols – Introductory Sessions (Modelling for 4 weeks)

Appendix 7c: Teaching Protocols – Evaluating gesture/ 'signs' in BS group (researcher)

Appendix 7d: Teaching Protocols – Language for Daily Routines

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Author's Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others. The work was done in partial collaboration with Greater Glasgow Health Board, Royal Hospital for Sick Children (Yorkhill), City Hospitals' Sunderland NHS Foundation Trust, and Royal Sunderland Hospital.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the Department of Psychology Ethics Committee (on 29/10/08) as well as the University of Stirling Ethics Committee (where this thesis commenced on 16/12/08), the Fife and Forth Valley Research Ethics Committee (on 23/04/09), Greater Glasgow Health Board Research Department (on 4/12/09), City Hospitals Sunderland NHS Trust R & D Department (on 01/07/10) and Royal Sunderland Hospital HR Department (on 24/06/10).

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In spite of the six thousand manuals on child-raising in the bookstores, child-raising is still a dark continent and no one really knows anything. You just need a lot of love and luck - and, of course, courage.

Bill Cosby, Fatherhood, 1986

Whenever I held my newborn baby in my arms, I used to think that what I said and did to him could have an influence not only on him but on all whom he met, not only for a day or a month or a year, but for all eternity - a very challenging and exciting thought for a mother.

Rose Kennedy

Is Baby Sign all it takes?
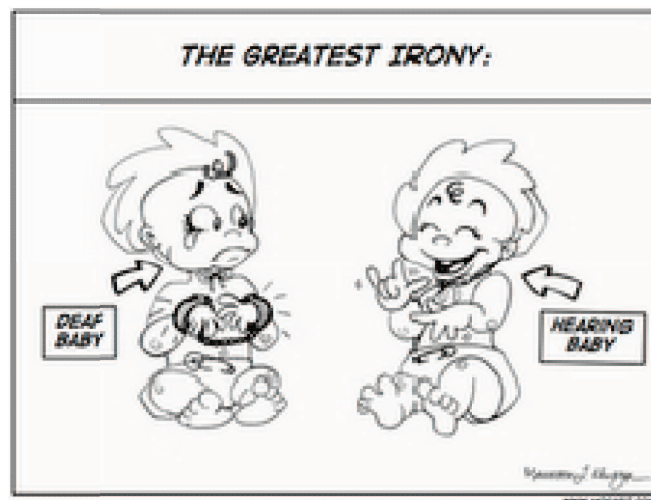
Cartoon by Maureen Klusza on http://deafbilingual.blogspot.com

An Introduction to the Aims of the Thesis

Parenting can be a rewarding and joyful experience yet at the same time demanding and overwhelming. It is a highly interactive process with skills learnt along the way, whilst the child is developing, too. Consequently, there is a plethora of materials offering parental guidance. To illustrate this, on keying 'parenting' into a book search on the Amazon website, 83,285 results emerged. Unsurprisingly, therefore, various enhancement techniques have proliferated, particularly in Western societies, for communicating and interacting with infants (e.g. baby massage, baby swimming, baby music groups, baby ballet, baby sensory experience and Baby Sign). Each of these makes claims regarding their effect on the infant's general development. Parents wishing to provide the very best for their offspring are bombarded with information.

Part of this thesis concerns parent-infant interactions and the impact of different communication interventions (as well as non-intervention) on the development of language and socio-emotional skills in early infancy. Two separate areas were investigated.

1. The effect of different interventions and deficits on language acquisition.
2. The effect of different intervention strategies on socioemotional development.

The thesis aims to show how each of these areas may be influenced by the context of communication: firstly in relation to the type of intervention parents use with their infant and to suggest that it is the quality of interaction rather than the method used which plays a significant role; and second, in relation to the impact of a deficit

environment, particularly communicative deficit caused by chronic illness. In addressing the first of these issues, there is a particular emphasis on Baby Sign (BS) as this has become fairly popular in the UK, probably due to claims of improved IQ, language skills, confidence, and self-esteem (e.g. http://www.itvbabysign.com/benefits-of-baby-sign).

According to The National Literacy Trust there are currently 100 BS programs running across the country (www.literacytrust.org.uk/talk_to_your_baby /key_topics/ 1285_baby_signing); and as a concept BS has received media coverage from the *BBC*, *The Scotsman/Scotland on Sunday*, and *TES*. However, in each of these cases *anecdotal* evidence of BS's success is cited, with only occasional reference to research studies, such as those by Acredolo and Goodwyn, which began to appear in the 1980s. This predominantly anecdotal basis makes it very difficult to ascertain the *generalizability* of claims regarding the advantages of BS.

Previous literature has already shown that infant-directed speech and parental gesture assist in language acquisition (e.g. Snow, 1986; Goldin-Meadow & Morford, 1985) - so does Baby Sign (BS) offer substantially more than these interventions? This thesis outlines a longitudinal study to investigate whether BS can show an unequivocal advantage for language acquisition and development, as well as for socioemotional development, over and above other intervention strategies.

First a definition of Baby Sign is required. BS is a keyword augmentative system which accompanies speech by using symbolic gestures. As some teaching programmes

deliberately adopt signs from recognised sign languages of Deaf[1] people, it is BS based on British Sign Language (BSL) which is used in the thesis study. Proponents of BS suggest that it facilitates not only accelerated language skills (comprehension and production) but proffers socioemotional benefit, too. They base their language claims on Werner and Kaplan's (1963) seminal work which suggested that infants have a symbolic capability in advance of verbal skills (e.g. Acredolo & Goodwyn, 1985). This capability could therefore be communicated to others via a well-established infant system – the manual mode – until the infant is able to voice them. Thus, an infant learning and communicating via BS might be less frustrated due to access to accelerated language skills – and the effect on parent-infant interaction would enhance socioemotional development, in terms of confidence, self-esteem and intersubjectivity. As language is an interpersonal process (even in terms of self-talk), it is argued that other aspects, such as attention (e.g. Moore et al., 2001) are equally improved. If there is substantial evidence to show that BS is in advance of other intervention methods, all parents should be aware of its benefits.

BS' claims also link heavily into previous research from the field of gesture (e.g. Goldin-Meadow, 1999) especially the particular role that prelinguistic gesture plays in language and cognitive development (e.g. Carpenter et al., 1998). Many previous papers, however, have not compared BS to other types of intervention method, so it is difficult to distinguish between effects emanating from individual differences in language acquisition across infants, and a potential direct effect specific to the particular communication method employed.

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[1] Captialized due to recognition of Deaf communities as culturally-distinct bodies.

In this thesis, studies were set up to investigate parent-infant interactions in two discrete ways. Firstly, the longitudinal study commenced when infants were 9 – 11 months' old and followed their linguistic and socioemotional development for 20 months. The specific communication intervention systems (Baby Sign, enhanced verbal, and enhanced nonverbal techniques) were allocated to different groups of parent-infant dyads. This was to ascertain whether particular strategies had an augmentative effect on targeted aspects of the infant's development. To gauge whether communication intervention per se was beneficial, these groups were also compared to a non-intervention cohort. The methods used and results found are discussed in Chapters 6 and 7.

In a separate shorter study the impact of childhood chronic illness (namely ENT-related conditions) was investigated in relation to parent-child interactions. The aim here was to ascertain how the illness impinged on language and socioemotional development within the interpersonal context. Participant dyads were sourced from two ENT outpatient departments and explored the effects of chronic otitis media with effusion (OME) on interactions and socioemotional development. The impact of OME on the family's quality of life (as perceived by the parent) was also analysed. Many previous studies have investigated the effects of the OM spectrum on language acquisition and development but less focus has been given to nonverbal mechanisms which may be affected during parent-child play, such as eye contact, joint attention, and coordinated joint engagement. Working with volunteer outpatients sourced at two discrete hospitals, data were collected based on video observation, more formal parental reports of socioemotional development, and parental perceptions of the family's quality of life (QoL) in relation to OME, throat infections or a non-ENT control group. This second

23

snapshot study involved children between the ages of 17-47 months. The methods and results are discussed in Chapter 8.

The thesis is framed in the following way. It firstly outlines various theories of language and how these relate to the types of infant-parent interactions which are observed (Chapter 1). This includes looking at the development of such skills as pre-linguistic socio-cognitive tools, the establishment of interpersonal meanings, and the role of imitation and matching. The thesis then outlines the pattern of language and gesture development in typically-developing hearing infants, with some reference to deaf infants, including those with chronic otitis media, and infants with visual impairments (Chapter 2). At this point the thesis turns to investigate how language development, attachment and intersubjectivity mutually influence each other during the early years (Chapter 3). Chapter 4 looks at Baby Sign in more detail; critiquing previous studies of BS and their findings. Chapter 5 gives an overview of the general methods used within the longitudinal study as these are quite complex. Chapters 6 and 7 discuss whether the thesis studies show support for any of the previous claims for BS, and offer potential interpretations for comparing results. Chapter 8 gives an exposition of the OME study, relating the findings to the previous chapters regarding language and socioemotional development. Chapter 9 revisits the previous chapters, paying particular focus to Chapter 1, and suggests why the social interactionist model presents a grounded argument for language development. Finally, Chapter 10 offers a summary and conclusion to the entire work and posits possible future directions for subsequent research.

Chapter 1: Theories of Language Acquisition and their Bases in Parent-Child Interaction

The acquisition and subsequent development of language in infancy remains a steadfast area of developmental research. Deceptively intricate, there is still much debate regarding how it emerges, with its complexity rendering language acquisition studies problematic. Recognising the balance and direction of co-influences, both internal and external, is far from straight-forward. Theorists have hypothesised about the respective roles of imitation and social learning, the quality of social interactions, whether there might be facilitating innate structures, or whether specific cognitive tools underpin the entire process. These perspectives have meant that the role of parents, siblings, types of interaction and relationships, as well as the effects of the wider culture have all been studied, resulting in an array of advice available to parents, including the marketing of different types of intervention and communication styles.

Crucially, because these theories have weighted influences differently, unique values have been placed on the respective roles of the cognitive, social and emotional spheres. Few have investigated how each of these areas might, along with language development, intertwine with and impinge upon *each other* at every level: from the micro to macro. Bronfenbrenner's ecological systems' theory (1979) did account for different layers of systems that could impact on the child's development but it did not comment on the psychobiological level within the child (Smith, Cowie & Blades, 2004). More recently, another theory, the dynamic systems' approach, has emerged which aims to explain why perturbations, *however slight,* at any of the levels, might lead to individual differences, even when the overall patterning appears to be similar. Such reasoning may be better-known from Chaos theory (Gleick, 1987).

Whilst this theory may better explain the range of *individual* differences that occur specifically in language development, the current thesis focuses on a functionalist approach to language acquisition, which emphasises how language develops and is used *in context*. By necessity it incorporates elements of pragmatic development, and stresses the importance of verbal and nonverbal interaction which occurs between interlocutors. In the case of infants the partnership between parent and child provides a rich seam of data. By comparing different interventions, specific effects can be gauged and their impact on the infant's overall development over time measured.

The preferred perspective taken by the researcher remains a crucial issue as it influences the rationale and type of study employed as well as the analyses used to interpret the results. If, for example, the belief is that cognitive development is a *necessary* requirement for language development, (such as, for (neo-)Piagetian theorists), investigation of individual differences in the level and quality of cognitive skills that appear prior to, say, language comprehension may provide information regarding specific links between the two. Alternatively, if the belief is that cognition is a necessary yet not *sufficient* requirement for language to emerge, (such as for Bruner), the role of the environment and social interactions take on a greater emphasis. Finally, the belief that language is an inherent mechanism which is already part of the infant's mental endowment pre-birth, (for Chomsky and neo-Chomskyians) - albeit a mechanism that requires stimulation from others in the post-birth environment - relegates some aspects of language acquisition to a more pre-determined course. Each of these perspectives predicts a different expectation for language acquisition depending on the tools and resources available.

Attention in this thesis is given to several theoretical perspectives: behaviourism/ associationism, constructivism, nativism, socio-culturalism, and functionalism. Claims relating to specific skills and tools highlighted by each of these theories, such as imitation, intersubjectivity, as well as joint attention, and coordinated joint play, have been scrutinised to evaluate support for their influence in the language acquisition process. These theories are outlined in order to establish possible mechanisms upon which different types of infant communicative intervention draw. For example, Baby Sign is championed as beneficial for gestural and early language comprehension as well as production. It is also claimed to foster better attention and self-regulation. The following chapters set out whether there is supportive evidence for these claims. However, it is important to place these mechanisms in a theoretical context. For now, focus is on the theoretical bases to language acquisition – starting with behaviourism as it has influenced all the following theories, even though these have adapted and redefined the emphasis initially given to biological processes, especially to that of stimulus-response, over time.

Early theories of language development

1.1 Behaviourism/Associationism: The infant as mimic

Although it no longer maintains the same dominance as in the first half of the 20th century, behaviourist approaches prevailed in child development research until the feasibility of cognitive investigations became a reality during the 1960s (Breakwell et al., 2006). Skinner (1957), a key behaviourist scholar, postulated that infants might learn language in a similar way to instrumental conditioning: in this instance through parental shaping and modelling. It was thought, therefore, that children developed

linguistic competence on a stimulus-response basis: that is, imitating patterns, especially verbal patterns which they heard, if rewarded; and ceasing to do so if the reward was withheld, or if they received negative feedback. Reward became their motivation for continuing the imitation or for further fine-tuning. Little credit was given to the infant for any proactive involvement; rather it was seen as a reactive process based on responses to parental and social approval (Cruttenden, 1985). Such a perspective suggests that any BS production by infants is based on copying the parent's gestural output specifically for the reward of the parent's attention and positive response – not because the infant has intent to communicate.

1.2 Social Learning Theory: A mimic with representational capacity

When developmental researchers began to appreciate that infants were much more capable, including of playing an active role in their development, such an austere explanation for language acquisition in infancy attracted much criticism (Stuart-Hamilton, 1999). Bandura attempted to couple some of the behaviourist ideas with developments in cognition research. His Social Learning Theory is viewed as a midway point between behaviourist and cognitive theories (www.learning-theories.com/social-learning-theory-bandura.html). He retained the notion of instrumental conditioning, but did not agree that the environment was the sole stimulus source. He argued instead for a "reciprocal determinism": that there was equipotential for influence on the environment from the individual as vice versa. This inevitably acknowledged that infants had cognitive tools which enabled them to reproduce what they heard and saw in their environment in a *meaningful* way, rather than just vapid parroting. This becomes an interactive exchange.

Bandura suggested that infants gradually associated repeated verbal patterns in their environment with particular things within it *because* they could perceive and attend to these objects, store them as representations, and then recall them appropriately. At the same time, he continued to maintain that *motivation* to produce utterances was due to parental modelling and the latter's praise. Bringing a cognitive dimension to the learning process necessitated recognition of cognitive load. This prompted other researchers to investigate how these representations might be categorised. In 1957 Bruner had put forward the idea that perception of external stimuli was possible *due* to our categorization of objects. This inextricably related language development to internal as well as external forces. Others showed that these categorisations were based on perceptual commonality and difference (Golinkoff & Hirsh-Pasek, 2006; Pruden et al., 2006), and more specifically on features of function or shape (Clark, 1973; Nelson, 1974; Rosch, 1973). It was also found that categorisations started as more generalised category groups, progressively becoming more refined. This offered one explanation for the emergence of overextensions (e.g. all men are 'daddy', all four-legged animals are 'dogs') until further refinements occurred.

These theories point towards either mimicry (behaviourism) or imitation (Social Learning Theory) of BS signs and gestures by the infant, which are within the infant's motoric capability, especially if the parent has encouraged them. Social Learning Theory further suggests that infants might produce signs for objects and events in their physical environment (which they have shared with the parent), as they also now possess *mental* representations of them. The exact nature of such representations, however, is as yet unclear for the coupling to the sign does not yet necessarily suggest a

29

symbolic tag. Representations may remain in the sensori-motoric domain (e.g. as a visual/auditory/tactile image). Compare this to cognitive theories which suggest that a representation is only symbolic when it comes to stand *for* the real object and is discrete from it; or the more social theories which suggest that sign and representation only truly couple when an *intersubjective* meaning occurs – and where these meanings depend on certain contexts and particular individuals for shared definition. This will be defined in more detail later but the point here is that a mental representation is not necessarily one which has a communicative function in its earliest formation (Kuczaj et al., 2005).

1.3 Criticism of associationist and social learning theories

Whilst Social Learning Theory made a positive step by including cognitive qualities in the theory, clearly, there were salient flaws in each of the above treatises. This lack of awareness of the symbolic quality to language renders the language acquisition process rather more mechanistic, devoid of intent and meaning. Infants do not mimic blindly. From around the age of 9 months there is evidence to suggest that they are aware of goal-directed behaviour (Carpenter et al., 1998), and have a rudimentary understanding of causality (Kutsuki et al., 2009; Sexton, 1983). Such awareness is built up from the significance of intersubjectivity, affect and attunement – *interpersonal* features within the infant's development. This is in contrast to an emphasis on internal drives such as motivation or a staged development of cognitive awareness. Communication imparts a message that has been formulated by the creator and is intended to be understood by another. Without this, such infant communication would be more akin to an attention-seeking device.

In addition, by omitting the role of communicative intent, there is no place for a generative quality to language. Infants, who do not know an appropriate label for something, tend to use a variety of tools to clarify intent and establish common ground: such as pointing, overextension, or by combining known labels to form a conceptually correct alternative (such as 'booby bag' for 'bra' – personal observation; Leopold, 1948; Werner & Kaplan, 1963). Consequently, infants strive to engage. Imitation cannot account for infant rule generalizations, whereby phrases such as 'I seed' instead of 'I saw' emerge - despite the unlikelihood that they have been used by adults, and especially when infants have previously successfully uttered the correct strong forms. In terms of speech, there is no recognition that infants need to be able to parse the speech stream into meaningful units, or that they are aware of the statistical probabilities of phonemic boundaries (e.g. 'st-' not 'sd-') (Swingley, 2005). Above all, they do not account for the interaction between gesture and language, and the importance of both to the acquisition process. All of these are known features of early infant language development as evinced, for example, in studies of bilingual infants (Fennell et al., 2007) as well as in phonemic discrimination studies of infants during the first year of life (Werker & Tees, 1984).

In other words, these theories do not explain infant language development *in context*. Social Learning theory *might* imply some vague concept of semantics by the infant at this stage; however, by omitting any active knowledge of phonology or syntax, or the interpersonal nature of communication, (which includes defining meaningful gestural movements from random body actions), the type of language acquisition indicated is considerably impoverished. Moreover, there is no recognition of the role of pragmatics in the infant's production: affording infants no credit for having a concept of

contextuality, (or indeed any awareness of *social* objects in their environment), for example in their ability to social reference (Feinman, 1982); in their prelinguistic skills, such as referential pointing; when producing statements (Marcos, 2001); or in recognising intentionality. (What is the motivation for the self or the other for goal fulfilment: acquiring something desired in the environment for the self, or to present comment specifically with the intention to engage with others?). Although pragmatic skill develops more sophistication over time, the roots of pragmatic awareness are apparent, in areas such as turn-taking, and the appropriate production of social expressions, which infants do not interchange randomly. This implies that infants are aware of appropriateness before they begin to express themselves verbally with others.

This lack of acknowledgement of a symbolic capacity in both behaviourism and Social Learning theory is underlined by their omission of any role for preverbal skills: such as joint attention, and, in particular, a sharing of mental states or intention-reading (Tomasello, 2003). These appear to be aspects which are particularly human. The point has been made that in comparison to animal communication, complex language is a uniquely human characteristic (e.g. Stuart-Hamilton, 1999), not only due to this capacity for symbolic representation but also due to an ability to communicate about entities that are not present: 'displacement' (Liszkowski et al., 2009), and the recursive quality which is absent from other animal communication systems (Hauser, Chomsky & Fitch, 2002; although see Gentner et al., 2006). Tomasello (2003) suggests that animals communicate to arouse 'the behaviour and motivational states of others, whereas human symbols are aimed at the attentional and mental states of others' (2003, p 8). This takes human communication beyond the tenets of behaviourism, and, suggests potential qualitative differences between human and other animal communication systems that

find their root in socio-cognitive processes. In terms of illuminating symbolic development in prelinguistic infants, if BS claims are correct, it would be completely feasible to measure symbolic communicative behaviours exhibited by an infant alluding to a 'displaced' object or event – something which a comparative infant without symbolic sign capacity (and therefore an appropriate communicative tool) would not be able to do. Such questions render the study of the efficacy of BS worthwhile.

By comparing the different interventions of BS, enhanced verbal and enhanced nonverbal, there is a clear intention to clarify the roles of pre-linguistic gesture and symbolic functioning. BS' claims imply that infants using symbolic gestures are able to disambiguate any potential confusion (such as when pointing to a feature within physical space) as they can choose to sign it (albeit within their motoric capabilities), giving it a more specific identifiable form. Similarly, just as infants, who do not know the spoken word for an object/event, invent labels, so too might it be anticipated that infants using symbolic gesture might 'invent' signs within their productive skills for objects for which they either do not have a sign, or for signs which are not within their motoric capabilities. However, none of this could occur if such infants had yet to develop a functioning symbolic representational system which they were aware they *shared* with others, and were aware that they could *communicate* to others. Such knowledge implies concurrent changes within other developmental areas: an identification of 'self' versus 'other', a developing Theory of Mind (ToM), and a communicative intent to transmit a symbolic message. These go beyond the scope of the current thesis but should be highlighted nonetheless.

By not including any of these areas, associationism and social learning theory fail to discuss how infants' categorization systems might be affected, either through parents using increased gestures, iconic and/or cultural signs, or through eye gaze, pointing, and speech modulation. It appears, then, that associationism does not go far enough in its explanations for infant language acquisition. It highlights the motivational drive in infants to seek reward, especially from their primary carers. It illuminates parental shaping and modelling which is particularly clear in the acquisition of social niceties, such as 'please' and 'thank you' or 'hello' and 'goodbye'. Infants pick these up fairly quickly, probably as cultural rituals, without any symbolic meaning beyond the context in which they are used (although see comments re pragmatic relevance above). Yet, it assumes that there is no self-serving motivation for *self-reward*. Clearly then, there is more than mimicry involved in language acquisition. It is important to consider the infant's own role in the process.

1.4 Cognitive theories of language acquisition

1.4.1 Constructionism: The infant as creator

The work of Piaget has had an enormous impact on cognitive approaches to infant development. Through intensive study and observation of his own children, Piaget argued that cognition was fundamental to development in other areas, including language (e.g. Cruttenden, 1985; Hickmann, 1986). Indeed, he saw symbolic thought as a cognitive process which underlay the emergence of language (e.g. O'Reilly et al., 1997), a directionality not propagated by more social theorists. Piaget had a stage-theory, whereby an infant passed through various stages in sequence, unable to bypass or overlap any of them, or to complete them in any different order. In addition,

however, he also stressed that the infant *constructed* his/her world by internalizing experiences, actions, objects and symbols, and organizing them into category groupings, called schemas. Schemas were based *both* on the object processed and the process of learning involved in its acquisition (Nelson, 1974). This implies a multisensory representation. As Piaget indicated that schemas in the first two years of life were sensori-motoric in nature (Smith et al., 2004), he suggested that the infant created holistic representations of data from his/her senses and actions (e.g. by sucking or touching), not only by schematicising objects according to their texture, shape and so on but *also* by how s/he experienced these features (in the mouth, hand, or both). This is an embodied representation, in the here and now, which the infant then updated within these schemas via two complementary dynamic processes: assimilation and accommodation. With assimilation, the infant incorporated new experiences, objects, etc. into his/her existing schemas; with accommodation, the infant had to adapt and modify these existing schemas to fit the new information acquired.

The above systems suited Piaget's biological approach. He had a monoistic view of body and mind and therefore believed that the cognitive state of the individual required homeostasis as much as the body (Piaget, 1977). If the infant did not adapt his/her schemas, his/her cognitive state would remain in a state of disequilibrium. This, being an intolerable state, would require the mechanisms of assimilation and accommodation to work in concert and re-establish a state of balance until the next challenge to the existing schemas arose. In terms of language, the theory provided another explanation for production errors, such as over-extensions and generalizations which were based on categorization immaturities, and why the infant's language production changed over time as the infant's cognitive understanding became more elaborate.

35

Piaget is credited with focusing on "mapping individual cognitive growth" (Brown et al., 1996, p145), due to his emphasis on the *individual* child's constructive ability as the cornerstone of cognitive development. This emphasis on the construction of cognitive tools, however, was reflected in his attitude towards early language acquisition. In common with many researchers of the time, Piaget considered the child below the age of 2 years as being *incapable* of appreciating other minds or intentions (Donaldson, 1987). This resulted from the behaviourist influence which suggested such skills only developed with experience and maturation. Indeed, Piaget purported that the infant could not conceive of objects, social or physical, as external, *outwith his sensori-motor experience of them* (Beard, 1969; Sylva & Lunt, 1989). Thus he depicted the infant as egocentric and bound to an understanding limited by his own sensori-motoric viewpoint. He assumed language developed according to cognitive change; specifically that the developmental awareness of other person mental states as well as the emergence of a symbolic capacity heralded and drove the linguistic process (Hickmann, 1986).

Piaget then acknowledges symbolic thought but it stems from the individual and his/her interaction with the external world. As such, Piaget does not place great emphasis on the parent's role or social interaction, neither does he profess a belief that elements could be altered before the child had reached at least the pre-operational stage (from 2-7 years) due to these interactions. Instead Piaget promulgated the idea of a developmental timetable. The sensori-motoric infant has to move through the stages - becoming less egocentric - before s/he becomes capable of more sophisticated types of mentalisation. Piaget did recognise the importance of tools, such as imitation, but did not regard them in a social light, considering the infant as incapable of any representation of imitated acts until s/he had reached level 6 in the sensori-motor stage: the final sub-stage of that

developmental period, occurring around the age of 18-24 months (Fishbein, 1998). He did not credit the infant below 2 years with any semantic understanding, and only highlighted the role of others at a much later stage, when he suggested *peer* interaction "help[ed] children 'decentre' their thinking from one particular egocentric view in order to consider multiple perspectives" (Brown et al*., 1996, p 146). Adults were not *significant* interactants, and language was viewed as an adjunct, a by-process of cognitive growth, rather than an area worthy of independent study during early infancy.

What this predicts is a timescale for various types of cognitive, social and linguistic developments which cannot be circumvented, or forced over a shorter timescale. Thus, even though BS could present an embodied medium through which the infant might express his/her thoughts and ideas, the timescales for attentional, perceptual, symbolic and social development would remain unaltered, thereby rendering the signing produced similar to that suggested by the previous two theories: mimicked, imitated – but certainly not generated with symbolic intent until 18-24 months.

In this sense, Piaget's underestimation of the social element to language acquisition until a much later stage has an assumption of no advantage for parental sensitivity. The infant, incapable and unaware of any world view other than his/her own, ties any shift in ability to when *the infant* is ready to move on - and this should not occur until s/he has established a level of cognitive maturation that has culminated in the organization of experiences, representations and associations between objects found in his/her *physical* environment (Beard, 1969). By suggesting that the child was incapable of considering others' mental states till much later there is a direct contradiction of the view stated by Tomasello (2003) cited above. Implications are that the infant requires shared

experience, and co-construction of sensori-motoric pleasurable routines with significant others which will enable him/her to establish memories - and links between them - before meaningful communication emerges.

It is clear from other studies that Piaget was mistaken in his interpretation both of the degree and duration of infant egocentricity, and the infant's limited cognitive awareness in the early sensori-motor period. If infants are entirely oblivious to social partners they would be indifferent to *any* interactions with them. This is clearly not the case, with babies as young as 2 months' old responding to smiles and seeking eye contact (e.g. Woolfson, 2007). Piaget's belief that infants were incapable of facial imitation prior to stage 4 in the sensori-motor period, and therefore not before the age of 8 months (Benson & Haith, 2009), was also contradicted in 1977 when Meltzoff and Moore showed that neonates (between 42 minutes and 72 hours in age) could imitate adult facial expressions. This dispelled Piaget's contention that infants' imitations were initially a simple matching procedure which had to be visible to the child. Piaget had argued that the infant could imitate hand clasping as s/he could see in concrete terms the behaviour required. Matching facial expressions requires a different skill altogether – abstract mapping of features which you *assume* you share with another. The advent of such methodologies marked an important turning point within infant developmental studies.

What Meltzoff and Moore had succeeded in doing was to show that infants who had not been exposed to any social learning beforehand, exhibited an ability to isolate the same mechanism (tongue protrusion, lip rounding, etc.) even when they had had no experience of their own facial components or acquired knowledge that they were

replicating the movement. The authors argued that this showed an 'innate' mechanism which underlay and facilitated the infant's burgeoning awareness of other beings being "like me" (Meltzoff & Decety, 2003). This type of argument supported Trevarthen's (1974) thesis that infants had an innate awareness attuned to the affective states of others, and that from *2-3 months of age* they were sensitive to disruptions to this (e.g. in still-face paradigms (Kogan & Carter, 1996), or in studies involving depressed mothers (e.g. Cox et al., 1987). In 1955 Chomsky had already postulated that infants had an innate mechanism enabling them to interact with others. As humans are highly-social animals, researchers began to encompass language acquisition in the arena of innate skills. Infancy developed into a new targeted area of cognitive and social research.

1.5 Innate theories of language acquisition

1.5.1 Nativism: The hard-wired infant

In the same year that Skinner published his thesis on language acquisition, Noam Chomsky (1957) presented a vituperative challenge to his behaviourist approach to language. He highlighted that human language had a generative quality, postulating an underlying innate syntactical ability which enabled the creativity. Chomsky's theory is highly complex so it is only possible to deal with it superficially here (cf. e.g. Huddleston, 1979, for further information). By comparing it to other animal communication systems, he argued that 'deep syntactic structures' facilitated the infinite possibilities of human linguistic utterances, despite the finite number of available semantic units at our disposal (such as words, and morphemes); whilst other animal communication, without these 'deep structures' was less flexible and forced to follow rigid patterns of usage that could neither be rearranged or reinvented. He continued that

behaviourist terminology such as stimulus-response paradigms was inadequate to describe the observations of how language worked (Lyons, 1981). He also suggested that the young child's grasp of complex language structures, at an age when many cognitive skills were still developing, had to indicate that language was an evolutionary adaptation: a complex computational skill that had to be innate and outwith the infant's conscious domain (Lyons, 1981).

The concept of innate endowment was not an original one. Debates concerning nature versus nurture have been contested for many centuries (e.g. Locke and Rousseau in the 17th-18th Century). Nevertheless, Chomsky's theory dominated linguistic research for several decades. Principally, reasons for this related to the strong backlash against behaviourism mentioned above, but also to the 'information-processing' approach which burgeoned through the advent of cognitive research in the 1960s. At this time researchers refuted the value of phenomenological accounts but highlighted the similarities between the logical operational functioning of computers and the type of processing engaged in the human brain (e.g. Eysenck, 2004). A theory that related reason and specific mechanisms to behaviour and development was very much in tune with the *zeitgeist* of the time.

Chomsky developed the notion of a language acquisition device (LAD), thereby facilitating the possibility of infant language acquisition despite access to what he called an impoverished source: the often ungrammatical utterances of those around them (Lyons, 1981). The LAD was viewed as specifically human, implying a *qualitative* break with other animal communication systems, and that neuro-anatomical structures housing this mechanism should be identifiable. The purity of the nativist stance is

summed up in a statement made by Steven Pinker (1995), who remains a leading proponent of neo-Chomskyism:

"Language is not a cultural artefact that we learn…it is a distinct piece of the biological makeup of our brains…language is a complex, specialized skill which develops spontaneously, without conscious effort or formal instruction… and is distinct from more general abilities to process information or behave intelligently" (pp 4-5).

Pinker goes so far as to intimate that language is an 'instinct'. The problem with this approach is that it detracts from the possibility of *effortful* learning. Language acquisition is projected, as a process, as a *fait accompli*. Yet there are examples of solitary infants rehearsing previous dialogues in which they have engaged:

"The important features of her monologues were her practice and discovery of word usage. She could be seen to struggle with finding the right linguistic forms to contain her thoughts and knowledge of events," (Stern, 2000, p 173).

The above quotation illustrates how effortful language learning can be and this is not commensurate with an 'instinctual' behaviour. Comparative researchers, such as Tomasello, countered Pinker's statement by declaring that if language were instinctual it would have stereotypical features (Tomasello, 1995). Clearly, any observation of infant language acquisition reveals very few stereotypical features to it. There are some commonalities in the category patterns of first words produced, such as foods, toys, animals and clothes, as well as phrases used during activities, like 'all done/finished',

and social expressions, like 'ta' (Dunlea, 1989), and this is also seen cross-culturally (Stolt et al., 2008, although see also the Tardif paper below).

However, it is the family and cultural context which influences the balance of specific items and how they appear (Tardif et al., 2008). Significant others emerge as important role models.

1.6 The omission of family and culture: The case of feral children

One of the clearest examples of the importance of social and intimate bonds is that of feral children. Abandoned children, such as Genie, Natasha, or Victor of Averyon, had clear difficulties in developing human language. Although there are arguments, that such children may have had pervasive developmental conditions which led to their abandonment, research with some has shown that this was not necessarily the case. A lack of exposure to adult interactions and input had a strong detrimental effect on them. These children were unable to develop complex language, had poor phonological awareness, and were difficult to assess in terms of their symbolic representational capacity. There are suggestions of problems with distinguishing between self and others, as well as affective dysfluency. The ambiguity of Genie's language comprehension and cognitive understanding is exemplified in the following (all from a transcribed PBS interview with Curtiss in 1977):

"She [Genie] wanted, it seemed to me, almost desperately, to re-code her world with verbal labels. And sometimes, we would just stand at a window and *she would take my hand* [my emphasis] and point out the window at a panorama before us, and I wouldn't

really know exactly what it was she wanted to know the word for, but she would persist until she at least got a new word." (Curtiss, 1977)

"One of my memories was that we would go to a place, say, Woolworth's, where there would be a stand of spools of thread, and spools where each color thread would incrementally change from the spools next to it, and she wanted a word for every different hue. And, I didn't know… English doesn't have words for all of these different hues. And *she was very frustrated* [my emphasis] when I would say, "Very dark blue," and "Very, very dark blue.""

Whilst Genie seemed to be able to give labels to things from her pre-lingual past, she also had difficulty in forming more complex utterances:

"…when asked to make a question, Genie comes up with, "What red blue is in?""

These examples illustrate how difficult it is to analyse language acquisition clearly. Genie showed great interest in exploring objects (including people) in a sensori-motoric way, but the above illustrations do not clarify what her representations of the physical and social world were: was there a "buzzing, blooming confusion" (James, 1891), or could she form associations and categorical links between different objects she saw? The apparent need for one-to-one mapping between a word and a perception, such as colour, suggests that her representation of the world may have been composed of discrete units. Like many autistic children she used others as tools, using Curtiss's hand to point, not her own; potentially a blurring of self and other. Rochat and Striano (2000) have argued that infants begin to acquire an implicit self-knowledge from 2 months of

age due to their sensori-motor representations formed from their engagement with their own bodies and their environment. If this is the case, Genie's confinement to the potty chair limited her ability to develop a sense of agency or embodied cognition within her surroundings.

In terms of language, Genie lacked syntactic order in her utterances. Yet, she could access prelingual mental representations and apply verbal language to them – how did these links occur – from a visuo-spatial/affective representation of them that had perpetuated through time?

Curtiss stated that Genie's vocabulary was unlike that of typical infants, not replete with object names but labels for emotions, colours, and shapes (the latter two suggesting perceptually-based labelling, although not necessarily embedded in categories, see Nelson, 1974, and others). In addition, whilst she engaged in pointing, there was no indication that this was *referential* in nature. She used Curtiss as a pointing tool, thereby giving no indication of the development of a theory of mind, and no support for her intention to share mental states or to comment on what she was seeing, other than to direct Curtiss's attention to it (LaPointe, 2005; Curtiss, 1977).

These elements are viewed as crucial to human social cognition and language plays a strong binding role within that (Tomasello, 2003). Like most feral children, there was lengthy debate over Genie's neurological status at birth, but any deficiency, injury or pervasive condition was discounted when psychological testing showed that her mental development was increasing incrementally a year at a time, something unheard of in cases where infants (or adults) are known to have identifiable atypical problems. And

yet, her development plateaued, unable to progress beyond a rudimentary level. If there had been an innate mechanism for language acquisition why had this not succeeded for Genie?

One debate that has focused on the innateness of language as well as the importance of early socialization has involved questions regarding issues of the impetus for learning, the localization of language as a 'mental organ' (e.g. Chomsky, 1957), and the very nature of language acquisition: is it a skill which is domain-general, domain-specific, or indeed a combination of the two (e.g. Bates, 2004)? In truth, these debates are quite discrete but often they are brought together to emphasise a specific point of view (ibid, 1994). Fodor (1983) promulgated the suggestion that language was modular, thereby supporting Chomsky's view. Some researchers have pointed towards the respective roles of Broca and Wernicke's area in language acquisition but other studies have shown that different aspects of language may well be distributed across brain processes and architecture, even in areas which have other functions (e.g. Marcus & Rabagliati, 2009). Whilst there is support for the dominance of the left-hemisphere in language acquisition and development (e.g. Dick et al., 2004), neuroscientific studies of neonatal brains stress the brain's ability to self-organize to compensate for injury (e.g. Ballantyne, 2008), especially if myelination is incomplete (e.g. Amin et al., 2010; Aslin & Schlagger, 2006; Glass et al., 1998). How does domain-specificity or otherwise illuminate the intricate workings of language acquisition?

1.7 A neuropsychological perspective of language in the brain: domain-specific or general?

Effectively, domain-specificity centres on the modular or dispersed nature of language capacity in the human brain. Studies in neuroscience have been used to justify innate and domain-specific as well as domain-general perspectives. Firstly, Bates (2004) cites examples from focal brain injuries that support a theory that is not embedded in nativist ideology. This is due to the neonatal brain's plasticity which enables it to adapt to assault and reconfigure/self-organize so that essential processes can still take place. Obviously, over time the neural connections in the brain become more established, rendering plasticity gradually less flexible; but particularly whilst myelination occurs, neural connections can bypass dysfunctional areas and utilize those which can fulfil certain functions equally, or almost equally, well. Bates supports her point by showing that some children exhibit problems both in the area of early language acquisition and visuo-spatial cognition. This suggests two things: that certain areas of brain architecture may fulfil more than one function and that there are links between cognition and language that may be disrupted by perceptual, and/or sensory dysfunction.

Marcus and Rabagliati (2009) give examples in support of both a domain-specific and a domain-general hypothesis. They cite research involving children with specific language impairments (SLI) and those with Williams' Syndrome who show dissociative characteristics, thereby highlighting the possibility that some areas of language may not be subsumed by general cognitive skills. Their findings showed that children with SLI present with average/above average cognitive ability but disordered language competence whilst children with Williams' syndrome exhibit the opposite effects. This dissociation is further implicated as children with Williams' syndrome appear to have

problems with spatial reasoning yet have some understanding of prepositions. Alternatively, they state that the majority of more common language disorders and pervasive developmental conditions, such as Down syndrome, affect *both* language and cognition, therefore some domain-general mechanisms cannot be discounted. Their argument is that language has neither domain-specificity nor is it subsumed by domain-general mechanisms but that it consists of components which have been adapted and modified for species-specific purposes whilst others have retained some of their earlier multi-functional properties.

1.7.1 Studies of early brain assault

Staudt et al. (2002) showed that early brain injuries to the left hemisphere (LH) could be compensated for by the brain's plasticity. They deduced that whilst the left hemisphere dominated at a later stage, both hemispheres impacted on how language was acquired, with the right hemisphere substituting for deficiencies that affected the left, if the compensation occurred before the neural map became too established. At the same time, they also recognized that the right hemisphere was not as efficient at language processing, as greater areas of it were activated to do the same activities as a more economical left hemisphere. This placed a larger cognitive load on the brain.

In terms of feral children, the potential for such reorganization may therefore be lost, due to the age at which they are found. This lack of human care and contact, however, does not inhibit their becoming imprinted on the animals which do care for them, or prevent them from adopting their behaviours (e.g. perching and pecking like chickens, barking like dogs, chattering like chimps). As intersubjectivity and attachment are

known to play a role in language development, this finding suggests that whilst nurturing, imitation and socialization are important elements within the linguistic acquisition process, without *appropriate* human contact infants do not build the requisite pre-linguistic skills, such as joint attention, referential pointing and proto-declarative commentary that are so vital in establishing human language. By comparing the different levels of communication skill exhibited in non-human animals and human infants, it is clear that the latter go further, beyond attention-sharing to commentary and the sharing of mental states (Tomasello, 2003). The implication is that relevant socio-emotional interaction with significant others stimulates the necessary environment for language acquisition to occur.

1.7.2 Mapping brain architecture implicated in language acquisition

Advances in neuro-imaging have shown that there are many different areas implicated in the process of language acquisition (cf. Bates & Dick, 2002; Marcus & Rabagliati, 2009). Bates and Dick highlighted the close association between 'sensorimotor and language skills in the adult brain' (p297), whilst Marcus and Rabagliati cited the importance of the cerebellum and basal ganglia. These latter regions had previously been linked to smooth motor movements and control and were thought to have little association with linguistic development. They are now acknowledged as having a role in phonological processing (Booth et al., 2007). These associations between motor and linguistic areas, albeit shown in adult participants, are interesting. The cerebellum is a more primitive structure, and one that is present in other species. If it has a role in language development, suggestions of a phylogenic continuation may start to outweigh arguments for a unique human language system. For example, Gentilucci and Dalla

Volta (2007) speculate that communication developed via hands and mouth from eating behaviours; Roy and Arbib (2005) link hands and mouth to a motor theory of speech and the mirror neuron system; Capirci and Volterra (2008) link actions, gestures and spoken words in young children; and Corballis (2003) suggests that manual and vocal communication may have coexisted for at least two million years. Gestural communication has a vital role in language development.

Thus, these areas of association between cognition and language tend to support the contention that there are many structures and types of processes within the brain that are recruited for language acquisition; and moreover, that motor skills are related to how language is acquired. As Marcus and Rabagliati (2009) would contend, some of these areas will have other functions, whilst some may be predominantly devoted to linguistic tasks. In considering the findings of language acquisition of infants who have suffered brain traumas at an early age, it is clear that the brain can adapt so that they remain within the typical range, even though they may employ other structures to engage in the processing (Schafer et al., 2009). In this way, it is possible to see that the brain's plasticity can compensate for injuries to those areas which might be associated with language function (e.g. Bates & Roe, 2001; Plunkett, 1997) – *but only if* the infant is exposed to appropriate interactions and relationships with sensitive carers who can bond with and nurture him/her, as well as scaffold their learning experiences[2].

This brings the discussion on language acquisition away from an onus on cognition to a wider socially-interactive environment and key players within it. The creation of

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[2] Seizures, in terms of frequency and intensity, will however affect the overall outcomes for cognitive and linguistic development (e.g. Ballantyne et al., 2008; Kolk et al., 2011)

meaning between infant and parent, infant and siblings, infant and significant others is vital to all of these processes mentioned above.

1.8 Social theories of language acquisition

1.8.1 Socioculturism: The infant as co-creator

The key figure associated with socioculturalism is Vygotsky. Vygotsky stressed the dynamic and dialectic that occurs between the individual and the social context. Consequently, he advocated that each individual has a unique pattern of learning according to this tension between the two (Wertsch & Tulviste, 2005). Two aspects, however, were absolutely crucial to Vygotsky: that development stemmed from the culmination of socio-cultural knowledge and history, and that the individual, when exposed to it, had the ability to understand and derive the meaning from it (Minick, 2005). The vehicle for transmission of this knowledge was through social interaction, and specifically speech. Consequently, the learner had to have access to someone more knowledgeable than him/her, but crucially, that the learner was within the Zone of Proximal Development (ZPD) to be able to utilise the skills offered them.

The significance of these issues cannot be underestimated. Vygotsky did not see meaning as derived within the individual; rather that symbolism and meaning were transferred to the learner in an interpsychological way before the learner internalized it to an intrapsychological level. This brings an interesting dimension to the *intersubjective* nature of meaning, rather than to the individual's own psychological interpretation of a perceived object in physical or abstract space. It also provides a different perspective on the notion of cognitive development and internal speech: how

we understand the world and our relationships within it depends on the biases of the socio-cultural history to which we are exposed (compare Piaget, where we develop understanding of objects that exist *independent* of our culture and Leontiev (1979) who argued that the actual (essential) object is not available to our cognisance, only the representation of our transmitted socio-cultural interpretation of it). This dichotomy creates an interesting argument in terms of understanding which does not appear to derive from socio-cultural influences, such as those found in 'natural' scholars, like Srinivasa Ramnujan, a largely self-taught mathematician - and in autistic savants.

For Vygotsky, in terms of infant learning, primary caregivers transfer unconsciously accumulated socio-cultural knowledge and learning to their offspring – if the latter is within the ZPD: on the cusp between his/her actual level of competence (independent understanding or goal fulfilment) and his/her potential level of competence (the next level which can be achieved initially only via guidance or collaboration with more knowledgeable individuals). A period of consolidation for the new skill or behaviour to be internalized sufficiently occurs first, something which is potentially akin to Piaget's assimilation process, although Vygotsky did not openly relate the consolidation period to any developmental stage or maturation but rather implied the type and quality of social interaction that occurred as the key factor.

Unsurprisingly therefore, Vygotsky has had a huge influence on child development practices. In particular, some researchers have emphasised parental sensitivity to the child's readiness to learn a new skill, and to move from one skill level to another in many different areas (motor, cognitive, and linguistic). This is partly the reason why there are so many different intervention techniques available to parents, such as Baby

Sign. For example, the Edinburgh *Netsmums* website advertises the following activity groups for infants and toddlers: 30 classes for music, movement and dance, 9 for communication development (with or without gesture training) 34 for baby massage/ yoga and 10 for swimming - in addition to mother and toddler groups. Clearly there is a market for such interventions, especially since policy publications such as Birth to Three (Learning and Teaching Scotland, 2005) highlighted the importance of this developmental period.

1.8.2 Providing a scaffold for the young learner

Bruner developed and coordinated many ideas from the cognitive and socio-emotional fields, including Vygotsky's. In 1983, he wrote that the child's acquisition of syntax *depended* on the child's developing cognition in the "real" world, contradicting Chomsky's advocacy of an innate language device. He highlighted the role of pragmatics - language use in context - and so stressed the researcher's need to look at how language was used in *natural* contexts, not laboratories. He commented on the invaluable relationship and interaction between parent and prelingual infant, especially in terms of building up familiar routines, which he argued became the basis for establishing the infant's development of meaning and attention through prediction and the sharing of experiences. He asserted that infant engagement in such systematic behaviours as banging objects together or inserting one into another was *necessary* not something to be discouraged.

Although influenced by Vygotsky, Bruner did not entirely accept his fundamental assertion of socio-cultural learning, emphasising instead the role of others, especially

significant others in the infant's progress cognitively, socially and emotionally. Like Piaget he stated that the infant was active in his/her development; and whilst he did not rule out an LAD mechanism, he proposed that the type and quality of interaction was the more important element in language learning, something which he named the LASS system (language acquisition social support). This defined communication between the infant and parent as a *negotiated* act, rather than something akin to an input/output slot machine. This redirection of emphasis onto the concept of a parent who is sensitive to the infant according to his/her needs, offering the right amount and type of support at the right time, Bruner called 'scaffolding', due to its nurturing framework, not *consciously* tied to any developmental timetable, didactic methodology or politico-ideological theorising. Clearly, the interdependence of language acquisition and affective development was highlighted.

1.8.3 The mutual influence of communication strategy and affective development

By incorporating an affective dimension, Bruner highlights the effect of the holistic parent-infant relationship on language development. Significantly, Vygotsky did not discuss the influence of affect at all. Indeed, it is possible that he saw affect as a fairly primitive mechanism, uninfluenced by socio-cultural effects which operated on a higher plane. He viewed consciousness and thinking as unique aspects separating humans from other animals, and stated that speech gave the individual control over his/her behaviour (Minick, 2005). Notably, Vygotsky would also have seen consciousness and thought as products of the socio-cultural process - just as he did language - for it is the transformation of interpsychological meanings onto an intrapsychological level which

assures sublimation of aspects of the individual, such as affect. The implication is that he saw affect as something to be overcome.

Yet by commenting on the interaction of parent and prelingual infant, Bruner recognised the potential effect of the overall valency of interactions, and he was undoubtedly aware of the research into intersubjectivity that was conducted by scholars, such as Trevarthen. Many researchers now recognize the close links between language and socio-emotional development (e.g. Carson et al., 1998). Recent infant studies have shown that linguistic ability is correlated to amygdala size (Ortiz-Mantilla et al., 2010), and there is evidence that the ability to develop "common ground" appears to be impaired where there is bilateral amygdalae damage in adults (Gupta et al., 2011). Studies involving children with language impairment have shown that it is unwise to ignore correlations between affect and language acquisition. With the exception of Bruner, it is clear from the exposition of the above theories that affect did not exert much positive influence on their thinking.

1.9 The case of language impairment

Whilst typical language development can illuminate various mechanisms, language impairment offers insight into how these processes can go askew. Language impairment is a complex term, ranging from differential aspects of delay (such as those to be found in late talkers) to deviance, where a specific component of language is affected although the overall language pattern is not (e.g. Rice, 2009). Late talkers are identified when they have less than fifty words or no word combinations in their productive lexicon at 24-months of age (e.g. ibid, 2009) or are below the 15th percentile for their age and

gender on a Language Development Survey (LDS - Whitehouse et al., 2010). Schiff-Myers (1993) discussed whether there was a higher incidence of language impairment amongst hearing children of Deaf parents and concluded that this was no more likely than within the typically-developing population. Similarly, Mason et al. (2010) did not find a higher prevalence of language impairment in deaf children, an area which is much underreported (e.g. Marschark et al., 2006). Clearly, therefore, language impairment is a broad area to research in relation to socio-emotional development.

However, whilst some studies may focus on investigations of speech-related difficulties (e.g. Lai et al., 2001), and others on a diaspora of linguistic conditions, including specific *processing* difficulties related to comprehension and/or production, or difficulties associated with pragmatics (e.g. Bishop, 2001), previous research can be difficult to cross-relate. Rice (2009) highlights that as autistic spectrum disorders have received a wider-encompassing definition, diagnoses of autism versus specific language impairment (SLI) have become more ambiguous. Equally, children with IQ rates of 70-85 have at times been included in SLI studies (ibid, 2009). Any interpretation of previous studies, especially of those with children diagnosed with deviant language, has to be made with caution.

Thus far, findings on the relationship between language competence and socio-emotional health in children have culminated from two different approaches: the investigation of socio-emotional development in children with language impairments, and the reverse of this, investigating the linguistic ability of children who have been diagnosed with socio-emotional deficits (Redmond & Rice, 1998). Redmond and Rice emphasized that, whilst the different approaches indicate a likelihood of co-occurrence

of language and socio-emotional problems at approximately 50-70%, confounds within these previous studies, by including participants with general cognitive limitations or too wide an age range, obscure any directionality of potential causes and effects in this conclusion.

Alternatively, there seems to be consensus across several researchers that language-impaired children are more likely to exhibit any of the cluster of internalizing behaviours, such as shyness, withdrawal, anxiety and inhibition (e.g. Carson et al., 1998; Paul & Kellogg, 1997; Redmond & Rice, 1998, although see Whitehouse et al., 2010 who also found externalizing difficulties at the age of 2 years). Redmond and Rice (1998) have attempted to distinguish possible sources for these types of behaviour by comparing two discrete paradigms to interpret their data: the Social Adaptation Model (SAM), and the Social Deviance Model (SDM).

1.9.1 The influence of language on socio-emotional development

The SAM model gives an *interactive* account of the problems faced by language-impaired children, implying that it is the child's linguistic constraints, the specific context, and the assumption of others that the child's capabilities are low which create behavioural differences between typically-developing peers and the language-impaired child. The SDM model, however, implies that the observed behaviours stem from underlying socio-emotional traits. Redmond and Rice concluded that socio-emotional scales could become contaminated with language-dependent questions which might give the impression that the child has inherent socio-emotional deficits *independent* of language limitations when this is not the case. They stress that SLI children can function

well socially in certain supportive circumstances. Indeed, Whitehouse et al. (2010) highlight the success of late talkers in nonverbal communicative tasks, such as referential pointing, which show their communicative competence better than say in a naming task. They also point to gradual amelioration of any emotional/behavioural difficulty as the children's linguistic skills improve.

Indeed, studies of late talkers are in-line with those involving deaf children, where the hearing status of the parents is likely to affect the child's ability to communicate effectively and thereby their socio-emotional behaviour (e.g. Spencer et al., 2004). As approximately 90% of deaf children are born to hearing parents (e.g. NDCS) this can have a significant impact on aspects such as sharing attention. Attentional problems are cited for both SLI children and deaf children of hearing parents (e.g. Meadow-Orlans et al., 2004; Redmond & Rice, 1998), along with delays in theory of mind (ToM) development (e.g. Farrant et al., 2006; Meristo et al., 2010) and access to mental-state language (Lee & Rescorla, 2002; Moeller & Schick, 2006). These delays may not have a cognitive basis, as seen above, but rather are related to the restrictions of limited language competence, and therefore begin to recede as these limitations subside.

Another area where affect has been more greatly explored is in psychoanalysis. Whilst there are drive theories, the focus here is on dialogical processes. Stern (2000) developed the idea of dialogism in language, taking Vygotsky's premise of interpsychological meaning and emphasising it as 'negotiated interpersonal meanings' (2000, p170). Thus he suggested that words have different meanings according to the interlocutor and the context. To illustrate this, the phrase 'good boy/girl' uttered by a parent, or at a subsequent stage, by a teacher, peer, or friend, is likely to have a different

interpretation. This would apply both in terms of the person who uses it and in relation to the ever-changing dynamics of the specific context, the history of the specific longitudinal relationship between them, and the consolidated interpretations of the phrase internalized by the interlocutor in similar circumstances (during parenting with an older sibling, or as a child with their own parent and so on).

Psychoanalysis stresses the motivational basis for language acquisition and usage. Stern cites Dore's arguments for infants' engagement in linguistic exchange: firstly, that they attempt 'to re-establish "being with" experiences; and secondly, that they try 'to re-establish the "personal order"' (2000, p171). Essentially this means that, in the process of creating a concept of self, infants attempt to synthesise these potentially different meanings presented to them. If they can do this they are assisted in forming a more robust representation of self which is more likely to be successful when the words are used in similar ways. However, aspects, such as tone, facial expression and context, can present very different representations and conflicting views of self. If Dore is correct in assuming that infants talk to "be with" someone, then they require a representation of the 'other' and the 'self', and must be attuned - or striving for attunement - in an interpersonal space. At the same time, trying to 're-establish the "personal order"' implies a tension between the social and intrapsychological self. Researchers such as Bowlby would argue that this tension is harmonious when the infant feels s/he can explore the social realm safely and return to a safe base (attachment). This will be set out in more detail later. However, if correct, the infant who has a relatively predictable pattern to interpersonal meanings will be able to construct a more robust framework of anticipated behaviours, interactions, and outcomes from their day-to-day encounters.

This will in turn lead to their expectation of a secure base to which they can return when they engage in wider and wider forays into their physical environment.

This exposition of language's influence on socio-emotional development and the biases to which adults are susceptible when they hear a child with language delay, emphasise how the social orientation of language acquisition has far-reaching consequences beyond the task of comprehension and production of sound streams. A final theory will be explored here: the functionalist approach. This, more than any of the previously-outlined perspectives, attempts to draw together all of these aspects within *one* holistic approach. After this final exposition, the thesis will move onto the typical pattern of language development.

1.10 A social cognitive theory of language acquisition: The Functionalist approach – infant as mindreader

Tomasello (2003) suggests that two skills underlie language development: intention-reading and pattern-finding. As the latter of these is also found amongst primates (and possibly other animals), it is the intention-reading that Tomasello deems unique to humans, defining this as including skills which are based on joint attention (following, and initiating), as well as on imitation (of others' behaviours, some of which are culturally-derived). In other words, Tomasello argues for a system of language acquisition that is sensitive to means-end activities, is goal-directed, and takes into account the synchrony or conflict in the purposes of different actors.

By including pattern-finding in the theory, he ties the idea of categorization to the development of language: that due to a cognitive foundation embedded in perception

and the ability to form concepts, humans can create a shared world of meaning from their interactions with each other and with the broader physical environment. This requires recognition of sequences, associations, predictable patterns, and an embodiment of our sensory experiences in meeting physical and social objects. There are therefore interesting links to Piaget's sensorimotoric, concrete and formal schemas, Bruner's illumination of the need to systematize our encounters with the world in terms of the routines and rituals initially found in infancy, and Vygotsky's emphasis on the transmission of cultural symbols and tools.

Tomasello further argues that infants can develop language competence without the need for recourse to any innate mechanism specifically devoted to the purpose (such as Chomsky's LAD). He uses connectionist modelling as his basis for this, contemplating that the only major difference between infant and adult language status is that the latter have a 'structured inventory of linguistic constructions' (2003, p5) whilst the infant tends towards 'item-based' storage until their categorization systems become more and more refined. (This resonates with the one-to-one mapping mentioned previously in relation to Genie). At the same time he recognises the limitations of connectionist models to simulate real infant language acquisition as they do not employ intention-reading, and operate on linguistic units, such as morphemes, and words, whereas infants interpret more holistically, dealing initially with whole contextualised utterances before breaking them down into smaller linguistic units. Research by Bannard and Matthews (2008) with 2- and 3-year olds suggests that young children do store utterances as wholes. This raises the question what function does keyword signing (BS) serve if this type of model is correct?

Unlike Chomsky, Tomasello does not view syntax as a separate entity from other parts of the language acquisition process, or that its foundations are based in complex formal permutations; rather he suggests that syntax is no different to any other linguistic symbol, such as a morpheme, requiring cultural transmission from generation to generation, and acquisition ontogenetically by the individual child. He argues that syntax and lexicon are learnt by the storage of utterances, particularly those heard repeatedly in routines, which enable the infant to discover analogous patterns, and thereby learn how they function, where they are appropriate, and how they can be combined with others. In this way he justifies the heterogeneity of human languages which operate in different structural ways, unlike the specificity of say blackbird song, whether it happens to be in France or the UK (although see studies on animal regional 'accents', such as Helweg et al., 1998).

The beauty of Tomasello's approach is that it brings together many of the threads from previous theories, including that of the role of affect in intention-reading. However, there is also a problem with Tomasello's approach in that it does not fully address syntactic difficulties which some children have when acquiring language. For example, profoundly deaf children have problems in acquiring internal speech, the passive tense, embedded clauses, auxiliary verbs and inverted question formats (e.g. Bamford & Saunders, 1985). If Tomasello's view that syntax is acquired in the same way as lexical and semantic structures is correct, such a schism between acquisition difficulties should not really arise - as exposure to all of these elements ought to be similar.

So, why should these more rule-based constructions cause much greater difficulty? Typically-developing children on average develop the passive tense around the age of

3.6-4.6 years (Crystal et al., 1981), whilst profoundly deaf children *may* master some aspects of it around the age of 8-9 years, although many struggle with the more complex syntactical aspects even in adulthood (Mayberry & Lock, 2003). There are a number of possible interpretations that may be evoked to explain this. Firstly, there has been a tendency for deaf children to become locked into subject-verb-object (S-V-O) patterns, as these are very common in early language communications (e.g. Wood et al., 1987). Consequently, many assume that the noun closest to the verb is the agent of the sentence. Equally, if language has a visuo-spatial foundation, it is the movement of one onto the other which denotes the agent from the object within context. This information is not provided by a verbal delivery.

Moreover, if infants start language learning at an item-based level and graduate towards the adult's 'structured inventory', why is there not more evidence of infants expressing dissatisfaction with adjectival qualifiers, such as in the case of Genie with 'blue', 'very blue' and 'very, very blue', and evidence of a gradual decrease in this as their inventory builds up? Although such a theory would support the existence of a vocabulary burst (as the increasing number of analogies would create ever-increasing connections) there is no consensus regarding the definition for such a lexical explosion (e.g. in terms of quantity, or time scale, Tomasello, 2003), and individual differences suggest that it does not occur for all children (Bates et al., 1995).

Nevertheless, by highlighting prelingual skills, such as joint attention, perspective-taking, and imitation, Tomasello and colleagues provide a *non-lingual* basis on which language acquisition can be measured. This theory therefore becomes key to the current studies where nonverbal cues to language acquisition are paramount.

1.11 Gesture lends a helping hand

As many of the above studies have linked to aspects of speech rather than to language per se, Tomasello's theory enables the investigation of a wider spectrum of nonverbal behaviour. In 1985 McNeill suggested that gestures and speech were part of the same system. His definition of gesture was 'the movements of the hands and arms that we see when people talk…the hand and its movement are symbolic; they present thought in action' (1985, p 1). Pika (2008) referred to this and other studies when comparing the gestural communication in monkeys and apes to that of prelingual infants. She highlighted several uses of gestures for non-human primates, although the use of all of these types was not observed in every species:

- Attention-getting
- Signals of affiliation and bonding
- Assertive or submissive signals
- Sexual signalling

Pika's findings bring the focus back to the issue of intentionality: the goal of the gesturer. Does s/he have an internal state motivation (to acquire something) or a motivation based on the desire to communicate for its own sake? It is unclear in the above whether the gestures are intentional as opposed to exaptive/ instinctive behaviours. Bard (1992) distinguished between 'intentional behaviour' and 'intentional communication', the former being dyadic, whilst the latter was triadic in nature. She found that orang-utans used intentional behaviours when 1-6 months' old, using the parent as a tool to gain access to food which they desired. Thus, young orang-utans

showed goal-directed behaviour towards an object in their environment but this was not coordinated behaviour between parent and object; rather their focus was on one or the other. By the age of around 2 ½ to 5 years, Bard suggested that this behaviour now contained intentional communication. (Note adulthood in orang-utans tends to commence around 10-12 years of age). The difference here is that the older orang-utan can now coordinate looking between a conspecific and the desired object: there is a link between the three, rather than two separate dyadic aims.

However, it is still unclear as to the underlying basis of such 'triadic' behaviours. Taking eye gaze and pointing as illustrations, there is no evidence that non-human primates engage in triadic-looking intending only to *comment* on an object. Motivation still appears to be self-oriented: the desire to obtain something for the self. Moreover, once an adult, the number of gestures tends to decrease (Liebal et al., 2006), reinforcing this egocentric pattern. Liebal et al. (2006) found that 33% of gestural signals occurred during play, 25% during eating, and 19% during displays of aggression. The decrease may have been due to the increasingly solitary lifestyles of adult orang-utans, especially males. Yet, an alternative explanation links to Tomasello's (1994) observation that young primates appear to learn gestures as 'ontogenetic ritualization'. If there is no specific social learning process, such gestures contain no *group/cultural meaning* and this may be why individual differences between conspecifics can be so wide-ranging.

How do these observations compare to ones of prelingual human infants? Firstly, human infants show an ontogenetic progression in looking and pointing behaviours which develop from a dyadic position (pre-9 months), where they look/point at the object *or* the interlocutor, to a triadic position (post-9 months), where they are able to

encompass both the interlocutor and the object as part of the same communicative act (e.g. Carpenter et al., 1998). This suggests a cognitive shift: from sharing/following the parent's attention to directing it and signifying a communicative intent. Nevertheless, there is considerable debate as to the amount of social cognition possessed by the infant at each stage. For example, it has been suggested that human infants may follow a parent's turning head not because they are motivated in sharing the latter's interest towards the object but because they are predisposed to attending to the movement of the head itself (e.g. Corkum & Moore, 1995). Other researchers have variously concluded that infants distinguish between open and closed eyes when considering whether to follow eye gaze (e.g. Brooks & Meltzoff, 2002) whilst others imply that other cues such as pointing and/or head orientation are required to assist in the *accuracy* of locating the goal of such looking (Langton et al., 2000).

In terms of pointing behaviour, Bates, Camaioni, and Volterra (1975) identified two different types: imperative and declarative (e.g. Carpenter et al., 1998). As the names suggest, imperatives were defined as those gestures actioned in order to use the other person as a tool (to acquire something), whereas the declarative gesture was produced simply to share interest in something within the environment. It is the declarative type of pointing which is not apparent in non-human primates or in autistic individuals. This is thought to show the omission of a sharing of mental states (e.g. Byrne, 2003).

Bakeman and Adamson (1984) analysed joint interactions between parents and infants, and offered a range of different types exhibited: from on-looking, where the infant observed the parent doing something but did not partake in the activity him/herself; to passive joint attention, where both parent and infant were sharing an activity but the

latter did not appear aware of the parent's involvement (e.g. playing with a jack-in-the-box); to coordinated joint attention, where the infant was fully cognisant of the parent's role in the activity and shared his/her attention between them both. Considering all of these features: looking, pointing, and joint engagement, there appears to be a progressive change in terms of how long the infant remains engaged, as well as in his/her communicative intention. Whilst there is some support for infants utilising joint attention from 9 months, it appears that it is not until 12-15 months that there is any real frequency to this; and indeed it is at this age that infants are able to discount distracters within the direction of gaze (Carpenter et al., 1998).

As infants are assumed to develop a symbolic understanding around the age of 12 months (e.g. Bates et al., 1980) there appears to be a coming together of mutual skills: in awareness of other minds, symbolism and individual intent which have culminated from the build up of familiar routines and play. Compare this to claims that apes, such as Kanzi, Panzee (Savage-Rumbaugh et al., 1998) and Washoe (Fouts, 1998) have an ability to comprehend and produce simple gestural language, it is unsurprising that counter-claims, suggesting such behaviours are attributable more to cueing or conditional training (Petitto & Seidenberg, 1979), exist. Certainly there seems to be no spontaneous use of the language with other apes, or with offspring, thereby querying the underlying motivations of such communication *as perceived by the apes themselves*. Given the lack of evidence for proto-declarative/declarative gesture use in non-human primates, it seems non-human primates may be bound to their internal state motivations, context and dyadic focus.

To summarise, the general issue of domain specificity and the specific issue of symbolic representation within non-human primate communications remains ambiguous. Even when referring to canine studies, where it is more evident that dogs seem to have a better understanding of referential pointing and are sensitive to facial cues which non-human primates are not (e.g. Miklósi et al., 2004), there is no suggestion that they have an understanding of mental states but rather that they socially refer to owners when they are incapable of resolving a problem on their own. This suggests that dogs, due to their close proximity to humans, have become adapted to heterospecific learning, albeit with the proviso that it is still to attain internal state goals; and that humans have converged their behaviour to assist in this 'communication' (e.g. Hare & Tomasello, 2005).

All of the above raises the question of when symbolic representation, and the understanding of other mental states enters infant communication, and whether there is a symbolic feature to their gesturing before it appears in speech. This is a crucial factor in evaluating any production of Baby Sign the infant makes, especially at a pre-verbal stage.

1.11.1 Is there a gestural advantage in teaching infants a systematized manual means of communication?

Given the difficulties in investigating only speech-based language acquisition systems, and the ambiguity of findings in cross-species studies, it is clear that by looking at a gestural-based intervention system in infants, certain acquisition processes and constraints may come to light. This may help to illuminate postulated phylogenetic links

between gesture and speech further, especially as the gestural behaviours of non-humans are much more clearly defined and observable (Fitch, 2000).

Whilst adaptations to different environments necessarily obfuscate any phylogenic commonalities in gesture between humans and non-human primates there is no empirical basis to assume that human language is *qualitatively* different to other animal systems. Snowdon (2002) places human communication at a more complex end of a lengthy communication spectrum. Other researchers suggest similarities between the development of birdsong and human language (e.g. Doupe & Kuhl, 1999). The ability of dogs to understand direction of eye gaze (e.g. Míklosí et al., 2004) and pointing in their owners (e.g. Hare & Tomasello, 2005) suggests that *social* creatures share certain elements of communication skill with us. It is for this reason that gesture provides an excellent platform for investigating language acquisition in human infants. The Baby Signing model predicts that infants exposed to a higher level of gesture/joint attention within their interactions, are more inclined to initiate joint attention/gesture when communicating (Moore et al., 2001). In that sense an investigation of BS compared to other types of communication intervention should reveal differences in frequency and duration of these areas across groups. Alternatively, if there is no symbolic intent to the joint attention (especially initiating joint attention)/gesturing, the interactions may not be prolonged or more complex than attention-getting alone.

The next chapter addresses what is known about early language acquisition in typical development, and relates this to concomitant changes in the socio-emotional domain.

Chapter 2: Multimodality and Interpersonal Features in Typical Patterns of Early Language Acquisition and Development

BS uses a structured and enhanced multimodal communication system to assist the infant's comprehension and production, building upon developments evidenced in the younger infant, even those which occur *before* birth (e.g. the development of supra-segmental and statistical features of speech) due to its synchronised use with spoken language. In developmental psychology there has been much research investigating the prelinguistic underpinnings of communication and language, including the areas of intersubjectivity/attunement, intentionality, symbolic representation, joint attention, and recognition of individual mental states (e.g. Tomasello, 2003). In theory, BS claims to assist in many of these areas; however if, as Kuhl (2004) suggests, infants are particularly attentive to language used in the routines parents frequently establish with them, any study which measures play interactions and daily routines between the parent and child should flag up differences between communication methods and outcomes if any arise.

2.1 The multimodality of language

Other researchers have highlighted that common patterns of parental interaction are multimodal, especially in early infancy. For example, in relation to lexical development, Gogate et al., (2001) showed that infants tended to take information from the speech signal when accompanied with *synchronised* actions or objects for meaning. Thus, parents engaged in simultaneous showing of an item with labelling would be more successful in doing so than if the act were serial or asynchronous in nature. Bahrick and Lickliter (2004) have found that infants initially only detect changes in rhythm and

tempo when they are presented in bi- (audio-visual) or multi-modal contexts, whilst Cunillera et al. (2010) showed that infants segmented speech better when given visual cues. It seems infants depend on multimodal cues in the early months after birth, and many parents behave accordingly.

The multimodal redundancy hypothesis (Bahrick & Lickliter, 2000) suggests that both human infants and infant young of other animals are particularly predisposed to perceive amodal information presented simultaneously across modalities from their environment. The overlap of information provided in this way facilitates the infant's selective attention to focus on synchronous elements which are relevant to a unitary action or event (e.g. looking at the face and arm gestures of someone as they speak, involves processing visual, auditory, and motor aspects to understand the speech act but enables the filtering out of elements which are concurrent but irrelevant to that same act (such as the person's pallor, clothing, or if they are brushing their hair at the same time as talking about an unconnected event)). In so doing, Bahrick and colleagues argue that the infant's attention, perceptual understanding and memory for relevant information are enhanced (Flom & Bahrick, 2010). They continue that this dependence on multisensory information reduces as the infant becomes more experienced, so that by 8 months they are equally able to attend to stimuli presented unimodally only, such as a voice on the telephone (Bahrick & Lickliter, 2004). The multimodal redundancy hypothesis suggests that Baby Sign may be beneficial to comprehension between parent and child but decreasingly so over time.

These patterns of language acquisition, both via speech and multisensory cues, raise the question about the level of infant understanding involved. Swingley has suggested that by 8 months of age infants might have developed a basic receptive 'vocabulary' of several words, albeit as sound patterns without attributed meaning. Thus, he implies that whilst infants might access the speech signal, meanings may have to be layered onto patterns which they have already stored as auditory strings at a later date. Alternatively, Baillargeon, 1995; Kemp and Xu, 2008; and Spelke, 1994 argue that infants from the age of 4-5 months have some concept formation distinguishing between animate and inanimate objects. As many of the BS signs used are based on function/shape or action, BS may be able to resolve the nature of this, albeit at a later age, as infants producing such signs spontaneously would reveal a symbolic understanding/ representation of the object/act referred to.

Taking all of the above studies into account, in theory, both typically-developing infants and those struggling or delayed in speech recognition might benefit from an enhanced multimodal system such as BS, as it gives them additional cues to understand parental communications. Alternatively, BS might operate as additional visual noise for some infants who do not merge the synchrony of a 'sign' and speech signal but do merge the synchrony of a 'point' and speech. Predominant modality may play a role in how the infant combines the sensory data available. Differences between groups could illuminate whether infants do have concept formation for some objects at an earlier age.

2.2 Interpersonal mechanisms in language acquisition

Already there is an indication of the complexity involved in acquiring language for the infant: both verbal and nonverbal elements have a role. It is not sufficient in the long-term to reproduce a template of species-specific communication signals, such as is the case for many non-human species (Fitch, 2000). Neither is it sufficient to reproduce accurate imitations of speech sounds, on their own or in combination, if there is no appreciation that these sounds have a *symbolic interpersonal* meaning, and that interlocutors have *intent* to communicate when they use them (Tomasello, 2003; Werner & Kaplan, 1963). If there are several strands to language acquisition which intertwine to create the competence and ability we recognise in the majority of typically-developing infants over time, then, by enhancing the multi-modularity of cues between them, it may be feasible to offer bespoke methods which suit their learning styles better.

Ultimately it is the interpersonal element which is at the core of language acquisition. Infants need to learn how to use language appropriately and in context by gaining pragmatic awareness and skill. At the same time they need to produce language in a format that is recognised and shared by a linguistic community (utilising the semantic, syntactic, and phonotactic rules of that community – which is initially likely to be the immediate family). Thus they need to become aware of the content of the communicative message they receive or produce, and to anticipate that their interlocutor shares the world knowledge required for interpreting what is being shared.

A fundamental element of success is the level of synchrony achieved between parent and infant and a major detractor is parental anxiety. Beebe et al*., (2008) highlighted the importance of timing between mother and infant, especially in gaze rhythm and vocalization, for establishing predictability, and thereby communication development and affect regulation. Mothers who experienced high levels of distress (as measured by a self-report on depression, anxiety, self-criticism, and childhood experiences) had nine times more disrupted gaze rhythm patterns than mothers experiencing low distress; infants with high distress levels showed half the number of synchronised gaze patterns to the parent than those with low distress levels. Such disruption/lack of contingency inevitably renders successful eye contact between the two difficult to predict. Beebe et al. (2011) have since gone on to show that parental anxiety also leads to other conflicting behaviours: parents became over-vigilant visually but withdrawn emotionally, whilst infants became hyper-vigilant in coordinating facial affect with the parent but dampen their coordinating vocal affect. Predictability and intention-reading become difficult for both parent and infant under such circumstances.

These faulty patterns become the norm, and link to inter- and intra-psychic defence mechanisms, due to the mutual dependence of self- and interpersonal contingency patterns on each other. Beebe et al. (2011) state that contingency anchors social communication by reducing uncertainty in interactions, and that by 4 months in age infants are skilled at recognising contingent behavioural patterns. They, Bruner (1983), Fonagy et al. (2008), and Trevarthen (1980) all emphasise the importance of predictability for the infant's development of self and distancing of self from other - as well as for turn-taking, the establishment of successful generalized representations of

interactions (also Stern, 2000), and positive internal working models (Bowlby, 1969/1982; 1988/2005). Harmonious interactions are important.

2.3 Attunement

Synchrony relates to a mutual responsiveness between parent and infant which is well-timed and relevant; however, where this is disharmonious (e.g. in cases where the parent is depressed, the infant is disabled, or there is substance abuse) evidence suggests that the infant's expressive language is also adversely affected (Cox, 1988). Synchronous relationships lead to an attunement between parent and child. By necessity this attunement is a gradual accomplishment, but as parent and infant become more attuned to the mutually sensitive and subtle interchange between them, interactions are enriched. Part of the attunement is accomplished through imitation. Meltzoff and Decety (2003) have argued that this stems from an innate mechanism (cf. p 19). They continue that attunement is vital for subsequent development of empathy and a theory of mind. Additionally, correlational studies have shown that imitation has a link to the start of 'meaningful speech' (Bates et al., 1980), and clearly imitative behaviour helps bonding, as seen not only in parent-child dyads (Meltzoff & Moore, 1992) but throughout all sorts of human pro-social behaviours (Kouzakova et al., 2010).

Meltzoff and Decety (2003) further suggest that imitation is partly responsible for establishing primary intersubjectivity - another mechanism for establishing attunement. Also described as an innate skill, intersubjectivity enables the parent and infant to engage in multisensory interpersonal interaction (Trevarthen, 1980). However, unlike imitation, intersubjectivity encompasses the infant's predisposition to make

spontaneous emotive, motor, and gestural movements. Parents perceive these as communicative in nature as they *seem* purposive, consistent and context-relevant in nature. Such movements involve nonverbal elements including eye gaze, turn-taking, and emotional attunement. These will be detailed later.

So, the parent, who treats the infant's pre-linguistic vocalizations as meaningful, establishes a proto-dialogue that encourages the infant to maintain interest and continue exploration of sounds s/he can produce. This enables the infant to experiment with single vowel sounds, consonants, and bisyllabic and canonical babbling as s/he becomes more dexterous in controlling various components of their speech organs (tongue, larynx, lips, breath control, etc.) and thereby produce different types of sound. In gaining such mastery the infant's reward system is activated and the infant enjoys not only the encouragement of the parent but also the feedback s/he gets from hearing the sounds self-produced. It is this lack of feedback that is assumed to be the reason for the atypical pattern of babbling in profoundly deaf infants, where consonant sounds start to disappear and canonical babbling may not start till 11-25 months, unlike the average range of 6-10 months in hearing infants (e.g. Marschark, 1997). Of course, deaf infants may continue to engage in manual babbling, especially if parents also engage and respond to this. It is not known whether infants exposed to BS engage in manual babbling or not, although there is contradictory evidence for both hearing and deaf infants using manual babbling from Petitto and Marentette (1991) and Meier and Willerman (1995).

As the parent and infant are attuning verbally, they attune to each other's nonverbal behaviours, too (e.g. Trevarthen, 1980). From around 9 months the infant synchronises

his/her own arm movements with canonical babbling (Iverson & Thelen, 1999). By coupling this with eye gaze, parents' turn-taking and synchronised patterns of engagement arise (Trevarthen, 1980). Again this reinforces the importance of both verbal and gestural behaviours during development. The evidence of infants' motivation to produce verbal babble suggests that equivalent encouragement to produce gestures, such as in Baby Sign, might motivate the infants to produce them - especially if interactions are enhanced or prolonged.

Attunement also implicitly suggests a growing distinction between self and other, whilst maintaining recognition that self and other are similar (e.g. Meltzoff & Decety, 2003). The infant's ability to organise his/her world in terms of sensorimotoric experiences in an integrated way helps him/her to develop this distinction, and the internalisation of emotional regulation laid down during positive interactions with the parent, assists in developing mechanisms which facilitate attending to events beyond the directly embodied and situated experiences of the infant's own experience to the understanding of other mental states and experiences (e.g. Stern, 2000). All of these experiences intertwine, and are particularly effective when they occur in predictable and stable ways, as they enable the infant to create expectations of his/her physical and social world which can be regulated and understood according to a developing template.

As the current study involved infants from the age of 9 months, earlier key developments have been omitted here (however, see Cruttenden, 1985; Iverson & Fagan, 2004; and Woolfson, 2007 for further information). Nevertheless, progression in the early months shows that the infant's sensorimotoric exploration of the environment (physical and social) is paramount and the reciprocal interaction between parent and

infant underpins the whole process. An infant at this age does not *need* symbolic representations of the world. Their initial interactions become less based on innate mechanisms of imitation, and come increasingly under conscious control as other skills and experience develop (cf. Meltzoff & Decety, 2003 and infant mismatching). This appears to link to Werner and Kaplan's (1956) postulation that the infant initially perceives his/her world in a relatively undifferentiated manner but increasingly becomes more sophisticated over time.

Thus, through interaction with others the infant gradually begins to experience his/her social world and to *recognise* that the parent has something s/he intends to communicate to them about it. Again this realisation may be initially in terms of the emotive tone only but eventually the infant will come to appreciate that specific objects within the environment are attributed labels. This is around the end of the first year (e.g. Bates et al., 1980). As these become less context-bound the infant categorises his/her mental representations and these become more flexible with the infant being then able to call them to mind whenever s/he hears the respective symbolic sign denoting them. It is assumed that these categorizations are based on shape and/or function (e.g. Clark, 1973; Nelson, 1974; Rosch, 1973, although see also Butcher & Goldin-Meadow, 2000). Theoretically then, BS could assist infants in labelling and categorization of objects/events due to the iconic nature of some of the signs used.

In short, the role of the parent, who becomes increasingly sensitive to the differentiation in the offspring's signals, and offers differentiated responses (verbal and/or gestural) to him/her in return, should not be underestimated. The mutual interchange assists not only in the infant's speech development but also in their ability to retain action-based

memory traces of their interactions, and to systematize the patterns of routines between them (Bruner, 1983). Being able to predict actions and reactions then allows these patterns to be elaborated as time passes, involving an ever-greater differentiation in production, comprehension, and creation of shared meaning. This shows that at no point is the reciprocal interaction between the infant and parent unnecessary or redundant. Without these early interactions the foundations would be less robust. Moreover, the self-organizing properties of the brain within this dynamic context are enriched by experiences (Gerhardt, 2010). Clearly it is important that parents, especially fathers who may be less involved at this stage, are encouraged to interact with their offspring during the first months.

2.4 Prelinguistic gesture and language development from 9 months

In the early months the parent infers communicative intent in the infant (e.g. Trevarthen, 1980). Several changes have become evident. The infant may well be mobile now and therefore exploring an ever-widening environment. Various routines between him/her and the parent or with other familiar figures are well-established, and an intersubjective framework is in place so the focus becomes more dispersed. Now turning outwards towards objects (physical and social) in the external world in a more exploratory way, and with memory skills expanding, the infant may start to retain visual representations of objects within their surroundings - with or without symbolic portent. In a study by Cuevas et al. (2006) infants were found to make associations between objects which had previously only been presented separately although each had been associated with another independent activity common to both. Infants as young as 6 months were able to link the two objects after two weeks, thereby showing that

opportunities for learning occur much more frequently than previously anticipated.

There is, therefore, a suggestion that infants applying particular routines to a range of experiences (e.g. playing with a toy duck in his/her own bath, then doing the same with a toy doll's bath and duck and talking about these experiences) has the opportunity to build up a representation of 'duckness' in different situations.

Of course, infants between 9 months and one year of age, not only have a receptive vocabulary but are also beginning to utter single words (e.g. Bates et al., 1975). They now regularly follow eye gaze (Carpenter et al., 1998), and start to show, give, and request objects from familiar others, thereby initiating joint attention and widening the social focus from parent and self to include an external object or event (e.g. Schaffer, 2003). They will soon start to *direct* adult attention to objects (Carpenter et al., 1998; Mundy et al., 2007). These activities will be achieved via a combination of vocalisations, eye gaze, and pointing behaviours that help infants follow, attract, and maintain the adult's attention (Tomasello, 2003). An investigation of pointing might discern the level of social and/or communicative intent possessed by infants at different stages, and whether the impetus for these behaviours comes from an egocentric viewpoint (knowledge-seeking), a social desire to interact, or both. If this is feasible, how BS may operate between parent and infant might also become evident.

2.4.1 Types of pointing

In 1975 Bates et al. produced support for the emergence of two types of pointing between the ages of 12-18 months: proto-imperative → imperative and proto-declarative → declarative. They attributed proto-imperative/imperative pointing to a

'tool-use' hypothesis as they found infants commonly used it to acquire an object outwith their reach by getting the adult to obtain it for them. As such this type of pointing does not require the infant to have an understanding of other mental states: the goal is centred on their own need, desire, or want and therefore the infant does not necessarily require cognisance of their own social or communicative intent (e.g. Schaffer, 2003).

By contrast, proto-declarative/declarative pointing is viewed as having a very social, interpersonal aim; that is, it is assumed the point is *specifically* intended to communicate about an object or event for commentary or altruistic purposes (e.g. Gomez, 2007; Liszkowski et al., 2004). Only the latter type of point requires joint attention, leading some researchers to conclude that there might be different cognitive mechanisms involved in the two types of pointing described (Camaioni et al., 2004). It seems that whilst proto-imperative/imperative pointing is evident in non-human primates, proto-declarative/declarative pointing has not been observed (Liebel et al., 2007).

Studies of developmentally-disadvantaged infants also show a reduced level of proto-declarative pointing in their behaviours (Legerstee & Fisher, 2008). Interestingly Deaf[3] parents of deaf infants have an increased use of pointing, where a point may actually replace the sign that would otherwise be used (Erting et al., 1994) This may explain why deaf infants show an increased use of spontaneous pointing (Masur, 1983), spontaneity being important as Lock et al. (1985) suggest that pointing is not derived

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[3] There is a distinction made between 'Deaf' and 'deaf' here, the first indicating a cultural community, the second a medical condition.

from imitation. However, there is still much controversy surrounding the interpretation of point types, especially in deaf infants of Deaf parents as the studies have been too small (e.g. Pizzuto, 1994) and comparisons between studies have not been possible due to different methodological issues, such as the non-separation of deictic from referential pointing, and ambiguity in terms of classifying types of point.

Some researchers, such as Tomasello (2003), have continued to accept and expand upon the Bates et al. (1975) definitions of pointing by arguing, for example, that proto-declarative/declarative pointing shows humans may have a unique awareness of attentional and mental states of others. Other researchers have queried whether different interpretations may be plausible. For example, D'Entremont and Seamans (2007) contend that for infants to use this type of pointing as a communicative act they have to have a concept of self and other which, they argue, does not appear until 18-24 months in age. However, if Rochat and Striano's (2000) premise for an embodied sense of self is correct, it is conceivable that an infant could be aware of the *physical* separation between self and other based on proprioception. The infant may also be unconsciously engaging in 'like me' processing, believing that the parent is aware of their desire for the object and also aware of its location/presence in space.

Offering another explanation, Southgate et al. (2007) have postulated that proto-declarative pointing may actually still have an egocentric purpose at 12 months: one of *seeking information* rather than a social aim of *sharing interest* in an external phenomenon or to assist someone else. In this sense, their interpretation suggests that the infant is looking for the adult's attention but is not necessarily tapping into any alternative mental state or desire of their communicative partner. They attribute this to

the infant not having yet reached a developmental stage where they recognise common ground. In 1985 however, Lock et al. concluded that pointing was referential rather than requesting due to a correlation between infant postures and gestures made. Their findings were based on leaning forward for requesting and back for pointing, stating that pointing is always accompanied by back postures, thereby distinguishing them from failed reaches. The postural bias of the infants therefore showed whether their behaviours were interrogative or not.

Interestingly, there is some evidence that infants from 12 months on may offer emotional support, thereby appearing to have some empathetic understanding, but it seems that not until around 14-15 months, can an infant ascertain the cognitive goal(s) of another person (Bellagamba & Tomasello, 1999; Carpenter, Akhtar, & Tomasello, 1998). Again the understanding of social and communicative intents appears to be progressive and linked to developments in other areas. Carpenter et al., (1998) found that pointing with eye gaze changed from 12 months, when the infant looked at the object first and then to the parent; to the pattern at 14 months when the infant pointed to the object and looked at the parent simultaneously; to finally at 16 months when the infant looked at the parent first before pointing at the object. This suggests an increasingly social awareness and underlying communicative intent to their utterances. If this is the case, the intents lying behind BS production should reveal whether the infant is attempting to communicate just to achieve attention, or to make a symbolic reference/comment regarding a phenomenon outwith their own egocentric state.

2.4.2 Links to pointing - Joint Attention

Triadic looking - when pointing - brings this overview of nonverbal behaviours to joint attention (JA). JA is viewed as a fundamental milestone in early infancy (Flom & Pick, 2003) and "the crown of prelinguistic development" (Dromi, 2003). Its relationship to early language development (Tomasello & Farrar, 1986), as well as to cognitive and social development (Mundy et al., 2007), and its emergence between the ages of 9-12 months (Adamson & Bakeman, 1991), make it a valuable measure with which to compare groups within this current study. Indeed, despite the arguments in the BS literature for commencing teaching symbolic gestures at 6 months (see Chapter 4), the appearance of JA seems to offer a better starting point, as it is at this juncture the infant is able to focus on the parent and the parent's behaviour, and has a better understanding of communicative intent.

Having established intersubjective routines - the pattern and context of which infants can predict - parents lay the framework for facilitating their infant's understanding. They continue to consolidate interpersonal meaning by tuning into the latter's focus of visual attention, as well as by using attention-getting devices which include giving, pointing, eye gaze, and verbal commands, such as 'look!', 'watch!', 'see!' (Zukow-Goldring & Arbib, 2007). In 1983 Tomasello and Todd found that there was a significant link between joint visual attention and subsequent infant language development. Moreover, they established that the most successful of techniques in creating joint attention was during times when parents *followed* rather than directed their infant's focus of attention. They hypothesised that joint attention was vital to establishing meanings, and by following the infant's focus, this reduced the ambiguity.

Tomasello and Todd also found that parent and infant talked more, had more conversational turns, and that mothers used shorter sentences and more comments during joint attention episodes. Clearly there are effects which go beyond the visual and nonverbal.

2.4.3 Joining the circle between intersubjectivity and joint attention

Joint attention also has some resonance with Trevarthen's primary and secondary intersubjectivity: the first entailing dyadic interactions between parent and child, the second incorporating a third element (mother, infant and now object). Just as children with pervasive conditions, such as autism or Down syndrome (Clibbens et al., 2002; Willemsen-Swinkels et al., 1998), and infants of parents who have become addicted to drugs or alcohol (e.g. Swain et al., 2007) have problems with intersubjectivity, so too do they have difficulty with establishing and maintaining joint attention. However, it is unclear whether it is an exclusive failure to share this visual context that underlies the difficulties these children face or whether there are concomitant issues. Spencer (2000) suggested that hearing children may coordinate auditory and visual systems to engage in joint attention episodes, and deaf children of Deaf parents may coordinate tactile or gestural signalling with vision to achieve the same result. As most joint attention studies measure visual behaviours rather than any other modalities, including the auditory channel, the strength of Tomasello and Todd's premise of following attention is less clear, especially for 'at risk' groups. Further investigation of multimodal/multisensory redundancy in relation to the above is required (e.g. Bahrick & Lickliter, 2000).

2.4.4 Different types of joint attention

JA for this study was defined according to both the classic description: as "the ability to coordinate attention toward a social partner and an object of mutual interest" (Bakeman & Adamson, 1984, p 1278), and the more refined description by Seibert et al. (1982) who sub-defined JA as two different types: "responding to joint attention (RJA) [which] refers to the ability to follow the direction of gaze and gestures of others, and initiating joint attention (IJA) [which] refers to the ability to use direction of gaze and gestures to direct the attention of others to spontaneously share experiences" (Mundy et al., 2007).

Mundy et al. (2007) measured IJA as IJA with eye contact (IJA-EC) or as (IJA-PS) with pointing and showing. They found a significant cubic main effect for age, with "pairwise Bonferroni comparisons showing a marginal decline in IJA between 12 and 15 months and a marginally significant rebound of IJA at 18 months" (ibid, p 944). They hypothesized that this dip in IJA might occur due to consolidation effects or to interactions with other developing motor skills (such as walking), or social and cognitive skills (e.g. first words). Such effects may be attributable to the intricacies of developments within domain-general mechanisms and such results correspond to dynamic systems' theory. It is noteworthy that observation of JA requires occurrence over several time points. Equally, it should be noted that, whilst RJA has been evidenced in other primates, IJA appears to be a solely human capacity (Mundy & Newell, 2007). Its role at different points of development is not necessarily consistent.

IJA has been associated with frontal, rather than posterior, lobe activity, suggesting that it is more goal-directed, reward-related and more subject to inhibition or modification

(ibid, 2007). Frontal lobes, especially the orbito-frontal cortex, have been associated with the development of self, self-regulation and types of attachment (Minagawa-Kawai et al., 2009; Schore & Schore, 2008). Some studies have suggested that impoverishment in this area is associated with poor care in infancy (e.g. Chugani et al., 2001). According to Gerhardt (2010) the very development of the orbito-frontal cortex relies on relationships, especially in terms of their availability and quality. She emphasizes that the first three years are crucial. This makes IJA an interesting area to investigate, especially when linked to measures of attachment behaviours, and coordinated joint engagement formats. Again, interlinks between cognition, affect, socio-emotional interactions are implicated.

2.4.5 Some linguistic fine-tuning

Thus pointing and joint attention seem to be a gateway to the advancement seen in the infant's language development thereafter (e.g. Goldin-Meadow, 2007; Tomasello et al., 2007), especially when the infant is able to point and look in another direction across the midline (Masur, 1983). The infant quickly progresses to combining a point and a word label, before moving onto two-word combinations (Erting et al., 1994). Moreover, observations of infants suggest that verbal two-word combinations do not occur before the emergence of gesture-word combinations (e.g. Volterra et al., 2006). Research has shown that there is a two-tier system as to how these gesture + word combinations operate: starting in a complementary way duplicating the intended message amodally, but becoming supplemental, whereby the gesture and vocalization provide different strands of information thereafter (e.g. Goldin-Meadow & Morford, 1985). This shift may relate to the Bahrick multimodal redundancy hypothesis mentioned earlier.

In terms of Baby Sign, infants tend to produce point+sign combinations before moving onto the verbal labels. There is very little evidence for *hearing* children producing sign+sign combinations (e.g. Volterra et al., 2006, although note Doherty-Sneddon, 2008). In addition, most infants start to focus on the verbal modality around the age of 20 months, especially for referential/symbolic representations (e.g. Guidetti and Nicoladis, 2008; Volterra et al., 2006). This implies that speech may provide a more flexible vehicle for expressing the infant's thoughts (not only because it frees up the hands to conduct other tasks simultaneously with speech but also of course due to its dominance as a communication system of the infant's sociocultural environment. (Compare this to Martha's Vineyard where the dominant language from the 17th until the beginning of the 20th Century was ASL – Groce, 1985, and it is clear the sociocultural environment has a strong influence on communication).

2.4.6 Burgeoning conceptual complexity

Two-word combinations begin to appear around 18 months, or when the infant has a lexical repertoire of between 20-40 words (Caselli & Volterra, 1994). These authors suggest that such a development indicates the infant's transition from an unsophisticated *communication* system to a much more subtle and complex *linguistic* system. Braine and Bowerman (1976) imply, however, that the infant may still be fluid in how these combinations occur (e.g. 'gone daddy' versus 'daddy gone' so the syntactic nature of the utterance continues to be contentious. Dore et al. (1976) argue that the infant attains combinatory constructions slowly. They advocate three stages: that the infant adds phonological 'noise' to their one word utterances; then regurgitate phrases or word sequences they have stored; and finally join two single utterances together with unique

intonation and pause patterns that show they are still represented as single units. By the time an infant is using the combination 'blue car' syntactically, s/he will have the cognitive skill to plan and execute the utterance according to the syntactic rules of the linguisitic community, the symbolic representation of blueness *as part of* a car, and the expectation that the utterance will be understood by another person in context.

2.4.7 Comparing language acquisition in DCDP and hearing infants

When comparing the language acquisition of deaf infants of Deaf parents (DCDP) and that of typically-developing hearing children, there is conflicting evidence for the existence of a different timescale but not of a different order of acquisition between them (cf. Caselli & Volterra, 1994 versus Goldin-Meadow & Morford, 1985). This discrepancy is partly due to how gestures are interpreted, especially in terms of their symbolic content (e.g. Pizzuto, 1994).

Nevertheless, it is clear that some compensatory differences in *parental* behaviours occur. Erting et al., (1994) suggest that Deaf mothers of deaf babies pre-6 months in age spend longer in positive affect facial expressions (70-80% of time) than hearing mothers with typically hearing babies (50%). This is interesting when related to similar research conducted on the auditory modality which suggests that 6 month-old babies prefer a happy tone when they are spoken to (Singh et al., 2002).

The finding is important as Singh et al. (2002) who were investigating parentese, found that if they controlled for affective tone, babies showed very little preference between that and adult-directed speech. It seems therefore that the more exaggerated, almost

melodic range used in 'parentese' outweighs the other features, such as simpler, shorter syntactic constructions, repetition, and strong eye contact (e.g. Thiessen et al., 2005). As Deaf parents of deaf infants also use more tactile and pointing behaviours (Erting et al., 1994) there are potentially different attention-gaining strategies employed. A study of a Deaf adult communicating with deaf and hearing children shows an awareness of the differences required for effective input (DeLuzio & Girolametto, 2006). In this sense, the question remains does Baby Signing add sufficient value over and above what already appears to be an effective and adaptive process in human communication? One area in which it may well offer enhancement is in socio-emotional development.

Chapter 3 provides a brief account of attachment theory and how the quality of attachment may be measured. Attachment is then related to socio-emotional development and how these two areas may impact and interact with important aspects of language and communication development.

Chapter 3: The Role of Interaction and Attachment in Language Development

The previous chapter outlined verbal and nonverbal aspects of the typical pattern of language acquisition. It also touched upon elements of the interpersonal arena (e.g. attunement and intersubjectivity) to show that any study of language acquisition must go beyond the *mechanics* of comprehending and producing speech. Returning to the studies of language impairment in §1.9, findings showed that the acquisition and development of language can have an effect on the infant's socio-emotional development, too. It was of interest, therefore, to investigate whether language constraints could have an effect on other aspects of the infant's development, such as attachment.

3.1 What is attachment?

Humans have a lengthy process of maturation and this requires an adaptive behaviour system which ensures a balance between protection and learning for the offspring to survive and develop (Cassidy, 2008; Simpson & Belsky, 2008). It is therefore no coincidence that humans appear to be genetically predisposed to intersubjectivity (Bretherton & Munholland, 2008), and that the infant and primary caregiver, usually the mother, typically experience strong bonding emotions to the other. This reciprocity is vital to the success of the infant's development and the parent's desire to nurture. Bowlby called this reciprocal behavioural system 'attachment', bringing the interpretation of emotional disorders into real-world experiences and away from the previously-held view that they were caused by internal phantasies (Freud, 1976).

The role of attachment (Ainsworth et al., 1978; Bowlby, 1969/1982; Schore, 2001) and intersubjectivity (Bakeman & Brown, 1980; Trevarthen, 1980) in the infant's overall development are widely-recognised. In turn, previous research has also shown that these aspects of interactional behaviour have an effect on the development of joint attention, imitation, and gestural behaviour (Adamson et al., 2004; Carpenter et al., 1998). By comparing different types of communicative interaction, it was hypothesised that it might be possible to observe positive effects on attachment types across time. Again, as BS sites have claimed a socio-emotional benefit from this intervention, it was anticipated that such advantages should be evident, if claims were well-founded.

3.1.1 The theory of attachment

Bowlby's own background in psychoanalysis and psychopathology had led him to question then-current theories regarding the parent-infant relationship (Cassidy, 2008). Embedded in the Freudian perspective, it was widely held that any emotional bond the infant had towards the parent was secondary to a primary drive to be fed (e.g. Marrone, 2006). However, by looking at ethological examples, especially Lorenz's studies, Bowlby saw that young goslings still had close bonds to the parent even though they could self-feed (Kobak & Madsen, 2008). By accumulating empirical data, Bowlby and associates argued that parent-infant attachment was actually a primary drive in itself (Bowlby, 1969/1982; Harlow, 1958; Lorenz, 1935). Bowlby maintained that the infant had an innate urge to seek proximity to the primary caregiver, and this appears to be borne out in strong cross-cultural validity of the theory (v IJzendoorn & Sagi-Schwartz, 2008). However, this drive potentially served more than one purpose: by tamping down underlying fear mechanisms, common to all species (Gerhardt, 2010), it also enabled

the offspring to explore and learn about the wider environment, thereby facilitating the infant's development. Clearly, an obvious advantage of staying close to the caregiver is not only one of safety, but also one of *interpersonal* learning.

3.1.2 The reciprocity between proximity and exploration

Infants who are assured of their parent's availability and competence to deal with threats will happily investigate their surroundings, knowing that if they make a fearful, confusing or dangerous encounter, the parent will be there to regulate their emotional response to the experience. In this sense the parent moderates the infant's emotional responses whilst s/he learns how to regulate them for him/herself. This is not only accomplished in nonverbal terms (through eye contact, touch, smiling, gesture, and so on) but also through verbal means: using a soothing tone, as well as comforting words.

However, Bowlby discovered, in his observations, that infants who either had a poor quality attachment or had been separated from the parent were likely to suffer emotional distress. This would manifest itself in three ways: progression from protest at the separation or poor attunement, through to despair at the situation, until reaching a point of detachment, an acceptance of the poor state of affairs (Kobak & Madsen, 2008). This was not a problem if the negative situation was temporary, however, if the poor quality of attachment continued over time, the infant was likely to become insecure and establish poor internal working models of the mother, her availability and sensitivity to his/her needs (Marrone, 2006).

3.1.3 The role of internal working models (IWM)

The infant's initial existence in a sensori-motoric and affective present graduates to a more flexible and complex internal representation of their physical and social world, which allows reflection on past experiences and projection towards future ones (Bretherton & Munholland, 2008). In other words, an infant who may have previously dealt with the affective behaviours of others as snapshot frames, is now creating an internal 'film' of expectations for his/her interactions with significant others. Moreover, s/he is developing a 'storyboard' of him/herself in relation to others; therefore both models are mutually dependent on the other. This suggests that attachment is process-driven but the theory also implies the inclusion of structural features: the internal working models. It is suggested that these start to develop between 7 months and 3 years (Simpson & Belsky, 2008). Clearly, this is the period when language development is also to the fore.

Whilst this IWM pattern becomes the basis for predicting subsequent relationships, even into adulthood (Berlin, Cassidy, & Appleyard, 2008; Schore, 2000), it is not a static construct. Life consists of dynamic events and relationships and as the infant develops cognitively, socio-emotionally and linguistically, the IWM is subject to some tweaking. At the same time the model is relatively stable so that it is a workable construct, with the majority of experiences establishing the anticipated pattern. When the IWM is formed on the basis of a secure attachment, such tweaking maintains an overall positive character, with goal-correction[4] occurring between the parent and infant

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[4] This requires a sensitivity on the part of both partners, although the onus will be on the parent in the initial stages to try and gauge the intentions (goals) of the infant, adjusting their interaction/behaviours in

to maintain the successful partnership. Indeed, Bowlby highlighted studies where parents discussed feelings and intentions directly with their infants and related it to their own relationships, suggesting that such behaviours between parent and child endowed the latter with better perspective-taking skills (2005). Far from diluting any sense of self, such an approach is helpful. Bowlby's viewpoint has been vindicated by others, such as Harris et al. (2005) who have shown that advanced language skills are linked to better mind-reading skills, a correlation most likely due to the type and quantity of conversations infants have with their parents that involve taking different perspectives.

Several studies support these contentions. Vallotton (2009) observed that when infants were taught to use specific gestures and signs in addition to spontaneous nonverbal behaviours such as pointing, carers in a nursery setting were more receptive towards them in routine interactions. Spieker et al. (2003) remarked that sensitive day-care (nurseries and playgroups) could compensate for insecure attachments and poor stimulation in the home, especially for low-income families; and Page et al. (2010) concluded that verbal stimulation as well as maternal sensitivity and contingency had a positive effect on the child's socio-emotional development.

It is of note that parents tend to use less language overall with an infant who has a developmental delay or condition, and in particular use less mental state language (e.g. Gregory, 1996; Hodes et al., 1999; Howe, 2006). This suggests that support and intervention may be of assistance in these situations. Bowlby postulated certain scenarios where less secure attachments might occur, suggesting that defensive

order to secure the goal sought (e.g. getting out of a buggy/cot to be cuddled; attaining a toy to deflect boredom).

mechanisms would intervene to protect the self, making the establishment of 'good enough' relationships harder to achieve. For example, insecure attachments are more prevalent where there is a breakdown in intersubjectivity and/or communication mismatching (such as where there is post-natal depression, parental alcoholism, drug use, or hearing parents of deaf children – see, Cox, 1988; Hans, 2002; Reissland et al., 2003; Wallis et al., 2004).

In situations of abuse, Bowlby argued that the infant would have conflicting conscious and unconscious models of the parent and the self, preferring to view the self as 'bad' rather than the parent. The reason for this relates to the reciprocal model of proximity and exploration: not having a reliable base from which to explore would not only be detrimental to a sense of relative security, it would also limit the opportunities for learning. Bowlby also predicted insecurity where conflicting IWMs existed as a result of radically different sets of experiences and expectations with *different* significant others. Here, it becomes difficult to predict and interpret behaviours and intentions as the models required are so very different. Again Bowlby wrote that such a conflict would have a detrimental effect on the development of self. All of these examples illustrate the importance of good communication (verbal and nonverbal) between significant others and the infant, and the mutual detrimental effects which can occur when a consistent pattern of this type of interaction fragments.

3.2 The cyclical nature to interaction and attachment

One aspect within attachment models is that there appears to be an intergenerational transmission of IWMs due to the types of communication patterns held in family

groups. Parents tend to employ the same strategies as their own parents, therefore in families where there is little discussion of feelings and intentions this is likely to be sustained. This is unproblematic where secure attachments are predominant but it has been shown that intervention is sometimes required to assist parents and infants break out of a negative cycle (e.g. v. IJzendoorn et al., 1995). Crucially the longer defensive mechanisms are required, the more difficult they are to remove, potentially leading to cognitive dissonance, repression or dissociation (Bretherton & Munholland, 2008). Indeed, Madigan et al. (2007) purported links between mothers who had unresolved attachment representations and toddlers with behaviour problems.

Part of the issue seems to be centred on neural pathways affecting the prefrontal cortex (PFC) (Bretherton & Munholland, 2008). IWMs are founded on emotion, body maps, and social interaction. They also enable the individual to consider different courses of action, thereby granting them a flexibility of response and a sense of coping ability during problem-solving. Such responses are not based on emotional impulse/saturation, habituation, or conflicting cognitions but on regulation, reward evaluation and an integrated working memory. Neuro-imaging studies have shown that these roles are accomplished predominantly via intricately-twined mechanisms within various parts of the PFC. If emotion underpins memory and planning by suffusing experience with meaning (ibid, 2008), any dysregulation appears to be associated with damage within the PFC. If body maps are similarly dysfunctional, behavioural patterns are likely to reflect this. The implication here is that preoccupied parents are unconsciously less sensitive to attachment cues in order to keep underlying conflicts from spilling over defence mechanisms into conscious awareness. In turn they tend to use less

mentalization and are less aware of their infant's own internal mental world. Emotional

processing brings this discussion to the importance of the right hemispheric brain.

3.3 The role of the right hemispheric brain

The development of the right hemispheric brain is dominant in the first three years of

life (Schore, 2005). This hemisphere is strongly associated with visual, spatial, and

emotional information, with the right orbito-frontal cortex being particularly implicated

in emotional self-regulation (Gerhardt, 2010). This organization underlies the infant's

initial sensori-motoric, embodied approach to his/her environment, and why attachment,

intersubjectivity and attunement are so important, not only to the infant's language

acquisition but also to their socio-emotional development and initial development of

self (Schore, 2001).

By providing a framework for containing overwhelming emotions, as well as the right

amount of stimulation, the primary caregiver gives the infant the emotional security to

explore their environment, to look for guidance on and embellishment of their

experiences, to attend to communicative signals, and to share in a mutually-enhancing

relationship (Bowlby, 1969/1982). This does not suggest that the relationship has to be

perfect but that there is a certain amount of sensitivity and appropriate responsiveness

more often than there is not (e.g. Bretherton & Munholland, 2008). Set this in the

context of changes which occur post-three years in age, a time when there is a shift from

right- to left-hemispheric dominance, facilitating children's development of speech and

finer motor control (Chiron et al., 1997); the child with dysfunctional IWMs tends to be

more greatly affected by poorer attention or higher rates of emotional dysregulation.

Their exploration and/or intersubjectivity with others continue to be impeded (Gerhardt, 2010), and therefore their intersubjective learning opportunities reduced.

3.3.1 The potential effects of poor attachment: the role of the orbito frontal cortex

Thus, regardless of the reasons for poor quality attachments, there are reasons why parent and infant should be assisted in improving any persistent breakdown in their bonding patterns, especially during the first two years. Schore (1996) outlines the intersubjective process in the first few months of life, when the parent and infant engage in face-to-face contact. When the parent is attuned to the infant's internal state, s/he can regulate any imbalance so that the latter does not become over- or under-aroused. If this is misjudged the infant can become overwhelmed by the dysregulation they experience and is then flooded by adrenocortical responses; alternatively, the infant may remain unstimulated, and switched off to the interaction. Ultimately, sensitivity, responsiveness, and contiguity between parent and child lead to better communication and understanding. Baby Sign proponents would advocate the use of signs and gestures to enhance this understanding, especially when linked to better nonverbal cueing in terms of eye contact and expression of affect.

Several authors have discussed the impact on the orbitofrontal cortex (OFC) if a lack of attunement persists (e.g. Bretherton & Munholland, 2008; Gerhardt, 2010; Schore, 2001). The OFC has been described as a key component in guiding executive functions (Bretherton & Munholland, 2008), processing information related to reward and in coding information related to positive affect. It is therefore implicated in affective,

cognitive and social information-gathering (Lebreton et al., 2009). The implications for the child in any of these areas are obviously considerable.

Minagawa-Kawai et al. (2009) suggested that the OFC appeared to have a role in the regulation and encoding of affect in the attachment system, by showing that infants had stronger neural responses in that area to processing facial emotions of their own mother, especially when the latter were displaying positive emotions, and that parent and infant showed the same pattern of neural activation when they looked at images of the other up to one year in age. This supports Bowlby's 'reciprocal interchange' concept, that the parent and infant are locked into a symbiotic relationship, with each responding to the other. The same authors went onto suggest that it was the OFC in the right hemisphere that was particularly indicated in the above results.

Schore (2001) hypothesized that attachment processes were particularly important during development of the right hemisphere (RH) of the brain, as the right hemisphere was strongly connected to the limbic and autonomic nervous systems and was dominant in humans for the stress response. He argued that it was the attachment relationship which gave the child the capability to cope with different levels of stress during his/her lifetime. Moreover, he suggested that the RH was the dominant hemisphere until the infant reached 3 years of age (Schore, 2003), so that the early development of the self had to be embedded in the affective and sensori-motoric experiences of this time (Schore, 2005).

Gerhardt (2010) pinpoints the crucial period for development of the OFC as over the first 18 months (2010, p 46) and cites research from Chugani et al., 2001 who found that neglected Romanian orphans had very little OFC at all. This resonates with the lack of stimulation and appropriate contact with significant others mentioned for feral children in §1.6. The duration of effect on such deficits was illustrated in a study by Warren et al. (2010), who tested adults' top-down cognitive control when presented with simultaneous distracters. They found that insecure attachments made individuals more susceptible to distraction. All of these studies demonstrate strong support for the role of attachment in the infant's language and socio-emotional growth. As attachment is strongly linked to and mutually-influenced by language and communication, there are obvious connotations to be derived from these deficiencies in brain architecture: that is, infants who are predisposed to intersubjectivity and interaction suffer when insufficient or faulty stimulation occurs on a persistent basis. These illustrations provide support for a possible neurological mechanism which explains the cognitive and social deficits seen alongside poor communication. Moreover, they suggest a reason why some communication interventions may enhance interactions, and result in linguistic as well as socio-emotional advantages.

3.4 Outlining types of attachment

In 1978 Ainsworth et al. completed an observational study of 26 infant-parent dyads. They found that four types of maternal behaviour exhibited within the home were strongly related to attachment security: namely, sensitivity, acceptance, cooperation, and accessibility, with sensitivity being the most important. Ainsworth et al. defined sensitivity as 'alertness to the infant's signals, appropriate interpretation of response,

promptness of response, flexibility of attention and behaviour, appropriate level of

control, and negotiation of conflicting goals' (Seifer et al., 1996, p 13). As a result of

this study they also defined three attachment types (subsequently four – Main &

Solomon, 1986) based on the quality of the attachment observed.

They related these classifications to the infant's reactions when separated from the

parent for a brief period of time (Cassidy, 2008; Solomon & George, 2008): secure,

insecure/avoidant, insecure/resistant, (and insecure/disorganized). Insecure/avoidant

attachments are thought to occur where the parent seems unaware of the infant's

overtures to engage with her/him, or the parent acts in a frightened or frightening way;

whilst insecure/resistant patterns tend to appear more frequently in overly anxious/over-

protective parenting which is composed of erratic, unpredictable responsiveness (e.g.

Weinfield et al., 2008). There is high interrater reliability for the scores obtained from

this method, although there are cross-cultural differences in the relative proportions of

each category (v IJzendoorn & Kroonenberg, 1990).

Van IJzendoorn and Kroonenberg (1990) found that secure categories ranged from 50 -

75% across 8 countries, with the insecure/avoidant group the next prevalent in 5

countries 21-35%. Insecure/resistant types ranged from 3-14%, although the latter two

insecure classifications were in reverse order for prevalence in Israel, Japan, and China.

It is pertinent to note that different styles of parenting may prevail in collectivist

societies: such as shared parenting as part of kibbutz living (Maital & Bornstein, 2003),

or in a socio-politico collectivist culture where emotional control is prized (Li et al.,

2006; Wang et al., 2006). Takahashi (1990) also suggested that data from Japanese

children were subject to interpretation as such infants were not usually left alone at 12 months. This rendered the Strange Situation paradigm completely unfamiliar to them. Moreover, Japanese infants did not show insecure behaviours in any other environment. The fourth attachment type, (that of insecure/disorganized attachment), showed a predominance of abused/maltreated children with approximately 80-90% falling into the category (Cicchetti et al., 2006). As the name suggests, these infants showed inconsistent patterns which included behaviours from all of the other three groups.

However, there has been much controversy regarding Ainsworth *et al.*'s 1978 findings regarding sensitivity (e.g. De Wolff & v. IJzendoorn, 1997). These authors conducted one of three meta-analyses on previous study data in an attempt to resolve the issue. From their findings they concluded that sensitivity, whilst important under normal conditions, was *not* the only aspect which contributed to attachment security. In addition, they pointed to the importance of reciprocal engagement and timing, as well as appropriate levels of stimulation, parents' adoption of a positive attitude towards the infant, and giving them emotional support. This echoes the studies mentioned in §3.1.3, where verbal stimulation and contiguity were equally essential. It was hypothesised that different types of intervention, like BS, might utilise these factors if it was found that the intervention was more successful than any other.

3.5 The effect of life on infant development

At times traumatic life events occur within family life and impact on the types of interactions taking place. Two studies provide conflicting evidence. Egeland and Farber (1984) used a Life Events Scale with 267 mothers, asking them about their living

arrangements (with/without a stable, supportive partner). Their results suggested an effect on females at the age of 12 months for the Life Events Scale, whereas in terms of living arrangements, 50% of males were found to be insecure/avoidant if the mother had a partner who did not live with them, and 44% of males were likely to be insecure/resistant where the mother was in no relationship. This suggests that family trauma does not have a noticeable effect on attachment development.

By contrast an investigation, conducted over twenty years by Waters et al. (2000) into the malleability of attachment types across the lifespan, found that 72% of infants tested in a Strange Situation paradigm - and found to be secure - continued to be so in early adulthood. Yet, 44% of infants experiencing some traumatic change in the family had changed classification. Another 22% who had not experienced family crises also changed classification. Only 2 participants who had been scored initially as insecure moved towards a secure classification; thus the majority of these reclassifications are in the negative direction. Being a longitudinal study these findings are important for they support Bowlby's original postulations that early relationships establish internal working models which operate throughout the lifespan, and that external real events affect the quality of the attachment relationship rather than phantastic events occurring within the parent, infant or both.

Where early intervention has offered parents support, outcomes for intersubjectivity and parental sensitivity have improved. For example, Maldonado-Duran et al. (2002) investigated children who had been referred for mental health issues before the age of 4 years. They found that parenting skills had a greater effect on the infant's development than the severity of the condition for which they were originally referred. They

103

continued that support given to parents at various stages of pre- and post-birth had positive effects (e.g. improving marital communication pre-birth, offering psycho-social support perinatally, and encouraging the mother to have skin-to-skin contact as well as early breast feeding). Post-birth it was found helpful to give short-term, focused intervention to the parents unless the infant was at risk of abuse. This finding was also seen by van IJzendoorn et al. (1995) who found that intervention could assist in patterns of parental sensitivity but importantly also noted that such intervention was not as successful at improving the child's attachment security type. Again this suggests the vital role language and communication play in establishing internal working models and the long-lasting effects such psychological constructs may have on interpersonal relationships.

3.6 Assessing attachment without using the Strange Situation

Seifer et al. (1996) looked at attachment, maternal sensitivity, and infant temperament over the first 12 months of life. They used two different types of attachment assessment: the Strange Situation (Ainsworth et al., 1978) and the Attachment Q-Sort (Waters & Deane, 1985). The latter of these was designed to 'assess the quality of a child's secure-base behaviour in the home' (Solomon and George, 2008, p 404) and has been rated as a robust measure for attachment assessment across a wide range of ages (v. IJzendoorn et al., 2004). Seifer et al. (1996) found that observed infant temperament had a strong association to both maternal sensitivity and Q-sort security.

The Attachment Q-Sort (AQ-Sort)

Whilst the most popular method for measuring attachment behaviour is the Strange Situation (SS) (Ainsworth, 1978), it has several disadvantages, including the narrow age range when it can be used effectively, the cost implications, and the potential lack of ecological validity due to its laboratory base (Waters & Deane, 1985). Q-Sort methods began in 1953 (Stephenson) and have been used extensively within personality and developmental research. However, it was 1985 before Waters and Deane devised a Q-Sort for attachment.

A Q-Sort has three components and these are described as follows by Waters and Deane, 1985, p7:

1. "procedures for developing sets of descriptive items to which scores are assigned"
2. "procedures assigning scores to items by sorting them into a rank order, from most characteristic to most uncharacteristic within each [participant]"
3. "and a wide variety of procedures for data reduction and analysis".

Waters and Deane devised the AQ-Sort for three reasons: to extend and link SS laboratory findings to those the AQ-Sort could measure in the home; as an assessment tool to offer a cost-effective method of measuring attachment behaviours, particularly in relation to the concept of a "secure base" (Ainsworth, 1978); and to investigate the range of individual differences in attachment security that permeate beyond infancy.

In the current study, the Waters and Deane AQ-Sort was used for several reasons. It was a cost-effective tool to analyse attachment behaviours from video material and it provided a platform for interrater reliability when the latter were unable to see the infant at home in real time. Whilst there were other AQ-Sort types available (e.g. Pederson et al.'s, 1999 Maternal Behaviour Q-Sort, 1994/1999) the Waters and Deane original avoided the issue of parental bias and unreliability of scores (van Dam & van Ijzendoorn, 1988; Vereijken et al., 1997). The authors were also extremely helpful in answering questions as they arose. The main difference in the AQ-Sort is that it does not identify different types of insecure attachment but does distinguish between secure and insecure attachment behaviours.

In sum, this chapter has attempted to outline important features of attachment and its development. It highlights the importance of early key relationships on the infant's willingness to explore the wider physical environment and on the establishment of robust psychological structures which impact on long-term socio-emotional functioning, including on reward mechanisms, as well as on executive skills, such as planning. Thus, early interaction has a bearing not only on the social aspects of communication but in the structuring of brain architecture itself. Previous claims within BS literature have suggested not only a linguistic benefit but also an enhancement to socio-emotional development, self-esteem and confidence (e.g. Vallotton, 2009). Chapter 4 turns to define BS more fully, investigating the basis of the technique, and why claims of linguistic and socio-emotional advantage have arisen.

Chapter 4: What is Baby Sign (BS)?

Baby Signing is a communication technique which parents employ with their prelingual infants to facilitate understanding during their interactions. It supplements parental speech by simultaneously offering keywords in the form of symbolic gesturing (e.g. Doherty-Sneddon, 2008). Such symbolic gesturing may emanate from the infant initially (spontaneous gesturing which is adopted by the parent for interpersonal use), or may be taught to the parent and infant in a more conventionalized way: e.g. through formal classes, DVD tuition, or online resources. BS is not synonymous with naturally-occurring prelinguistic skills, such as deictic pointing, joint attention or imitation but is claimed to facilitate communication by encouraging gestural behaviours and a sustained pattern of shared attention, whilst also boosting confidence. The range of literature concerning BS states their ethos clearly (see e.g. TinyTalk™; www.babysign.co.uk; www.babycentre.co.uk).

Parents are often encouraged to start with their infant from 6 months in age (e.g. www.babysigners.co.uk; www.itvbabysign.com). This is because BS sites claim that infants from 6 months have developed concepts and ideas (symbols) which they cannot communicate yet through speech (which requires fine motor control). The argument here is that speech requires a longer time to develop but that the infants already have quite sophisticated gross motor skills as well as hand-eye coordination (www. signingbaby.com; http://en.wikipedia.org/wiki/Sign_language_in_infants_and_toddlers) which can be used instead. They claim that BS facilitates gestural dialogue - if infants and parents are given the appropriate skills. As a consequence of using BS these sites suggest that communication and bonding between parent and infant are enhanced, partly

by reducing the infant's frustration and enhancing their confidence to communicate, partly by increasing the parent's confidence in understanding what their infant is trying to communicate to them. Specific claims relating to higher IQ rates, earlier symbolic development, faster and more complex language acquisition and development, as well as better self-esteem have also been made (www.babysigns.com). Generalizability of data, however, is problematic due to different interpretations given to defining '*symbolic* gesture', the use of small samples, a lack of independent samples, and a non-reporting of statistical power and effect sizes. Consequently, claims remain fairly anecdotal, without robust scientific assertion.

Is there any support for the claim that the infant from 6 months in age has a sophisticated level of *conceptual* understanding? For example, from what age can the infant communicate a range of thoughts, memories, and wants, including expressing internal states, like hunger, thirst, or requiring a nappy change, or to engage in symbolic dialogue with the parent? To do any of these several skills must be in place. Taking hunger as an illustration, the infant has to recognise what hunger feels like and distinguish it from other sensory experiences such as stomach ache. This requires a sensory memory which has been stored from previous experience but which can be recalled in a format that has also been encoded linguistically: that is as a symbolic sign. It is not enough for this to be a visual representation alone as the infant would not see the communicative value in it. As a symbol it has to have shared reference between at least two interlocutors. Thus the infant must recognise the hunger state and that it can be satiated via another person (therefore by signing the infant is communicating a wish to use the parent as a tool to achieve a certain goal). In other words s/he realises that by signing 'hungry' to the parent, s/he *intends* to express a specific message and expects

the parent to understand that communication from the common ground they have established between them. Above all, the infant expects a certain effect to occur from their message: that his/her hunger will be satiated *as a result of* this communication.

This is complex reasoning and, as previously outlined in Chapter 2, the emergence of symbolism in the typical pattern of language acquisition is not explicitly supportive of BS' claims at such an early age. Claims made by proponents of Baby Sign use Werner and Kaplan's (1963) assertion that symbolism is seated in a wider range of cognitive skills to defend their argument (e.g. www.babysigners.co.uk). However, an ability to form a mental representation internally is not the same as then relating that representation to a label internally, before gradually de-contextualising the representation so that it can be communicated externally to others and allowing it to stand as representative of a range of objects which fit that category. To take another example, the red grapes the infant has for lunch on Wednesday is just one possible representation of 'grapeness'. This gradually has to come to encompass all the red grapes in the fruit bowl, arranged in the supermarket, drawn in a picture book, and so on. Such a process tends to be fairly protracted; with infants between the ages of 13-18 months using a range of modalities to comprehend and express symbolic entities; by 20 months showing a preference for the verbal mode only (e.g. DeLoache, 2004); and at 26 months showing a lack of association between a gesture and object unless specifically taught to do so (Namy & Waxman, 1998). This gradual movement away from gesture towards the verbal modality is supportive of findings cited earlier in §2.4.5, p 68.

Thus, it appears that if BS offers a benefit to infant-parent interaction, it may be time-limited. Nevertheless, BS proponents point towards theories supporting the link

between gesture and speech; in particular that they possibly share a common cognitive, sensori-motor basis (e.g. Gentilucci & Dalla Volta, 2007; Peperkamp & Mehler, 1999; Roy & Arbib, 2005); and that gesture is the foundation to language development (e.g. Iverson & Goldin-Meadow, 2005). The link between gesture and language is further supported by Iverson and Goldin-Meadow (1997) who have also shown that visually-impaired children, blind from birth, gesture – a finding which the authors suggest shows that gesture has a communicative function for the *speaker* as well as the interlocutor. With this backdrop it is unsurprising that BS is advocated as a suitable communicative aid to prelingual infants. The argument that infant prelinguistic abilities can be expressed in a gestural manner, harnessing a visuo-spatial means of communicating to utilise the infant's development in sensori-motor skills and thereby reduce their expressive frustration (Meier & Newport, 1990), is worthy of exploration. How did this link between embodied experience and language emerge?

4.1 An overview of gestural literature

In the 1960s several important studies emerged relating to gesture and language. Deaf community sign language was, for the first time, accepted as a *bona fide* language rather than viewed as a collection of pantomimic gestures without linguistic structure or culture (Stokoe, 1960). Werner and Kaplan (1963) postulated the emergence of symbolic representation from the infant's sensori-motor schemes and 'its action on the world', thereby highlighting the importance of observing and interpreting nonverbal behaviours. Groundbreaking research by Kendon (1975) into adult gestures accompanying speech led researchers in early development (e.g. Bates et al., 1975; Slobin & Welsh, 1973) to begin closer observation of pre-linguistic gestures used by

110

infants. As underlying linguistic and cognitive processes were not reliably-testable when based on the *verbal* output of babies - and the latter were poor informants - this opened up an extensive seam of research that continues today.

One of the key researchers in the field of gesture research today is Goldin-Meadow. She has produced a considerable number of studies showing that gesture can be a language-like system in its own right (especially amongst deaf individuals who have no access to conventional sign languages); or, when accompanying speech, a gateway to the actual thoughts of a speaker (even though these are not divulged verbally) (see Goldin-Meadow, 1999). In 1985/1996, McNeill posited that speech and gesture constituted a single unified communication system and that communicative content related to the same cognitive representation; only the mode of communication was different. Butcher and Goldin-Meadow (2000) investigated whether this unity of speech and gesture existed in very young infants. Their results showed that symbolic gesture and speech were not fully integrated until around 18-24 months, although infants at the one-word stage were capable of forming and using symbolic gestures without speech. This resonates with previous discussions of body maps and embodied cognition. Moreover, it is now known that gesture can demonstrate when a child is within the zone of proximal development (see §1.8.1 p 32) and therefore ready to learn (Goldin-Meadow, 2005).

In terms of infants, gesture use predicates speech development (e.g. Goldin-Meadow et al., 2007; Tomasello, 2003). Infants start to use gestures before any words and then will combine a gesture with a word before two words appear together (see §2.4.5, p 68). Such ontology is found cross-culturally, suggesting a universally-valid pattern which is not dependent on sociocultural influences (Blake et al., 2005). This strong link between

gesture and speech in terms of language development is evidenced in studies of children with developmental difficulties. For example, Woll and Grove (1996) showed that twins with Down Syndrome, and exposed to two languages from birth (English and British Sign Language (BSL)), had impairments in both languages, therefore the visuo-spatial modality offered no extra protection against this. Saletti et al. (2007) found similar results in the spoken and gestural communication of children with bilateral perisylvian polymicrogyria which were not related to cognitive limitations. These studies and others support an ontogenetic development of language acquisition which utilises elements from a spontaneous gestural foundation and orientates increasingly towards a spoken modality whilst remaining embodied within the motor system (Gentilucci & Dalla Volta, 2007). The question remains whether augmentative types of gestural communication offer enhancement in excess of these naturally-occurring acts.

Equally, it is important to note that despite these early observations of the links between gesture, speech and language development, there was no significant initial impact on deaf education or improvement to social access for many Deaf communities, especially in the UK and Germany. This was mainly due to arguments of language latency and the primacy of speech over other modalities. In the 1980s, some professionals became sufficiently aware of signed communication's potential, to integrate it as a teaching tool for children with other communicative or learning difficulties (Walker, 1978), and this has culminated in BS proliferation for typically-developing hearing infants. Paradoxically, deaf children born to hearing parents may still lack access to sign input, especially where Deaf communities have diminished.

Nevertheless, as a result of efforts in the 1980s, gestural and sign research have increased. There is now an awareness of the importance of pre-linguistic gesture as a precursor for first words, especially in terms of the sequencing of reaching, showing, giving, and pointing (Capone & McGregor, 2004; Carpenter et al., 1998), and we know of the respective roles of intersubjectivity, attachment, temperament and joint attention (e.g. Bowlby, 1969/1982; Bruner, 1983; Trevarthen, 1980). However, how do these social, interactive gestures relate to teaching 'symbolic' gestures to infants?

In 1985, Acredolo and Goodwyn published a case study based on the spontaneous gesturing of a female infant aged 12.5 - 17.5 months. Subsequently, others began to investigate whether symbolic gesturing might have an impact on early infant development. Often, however, the studies were not cross-matched with other types of intervention strategies, and therefore this thesis asks: does Baby Sign offer additional advantages (over and above other interventions) to pre-lingual hearing children, especially in terms of better and earlier symbolic communication, improved confidence and self-esteem, as well as benefits to the parent-infant dialogue, as publication claims suggest?

4.2 An overview of Baby Sign literature

In 2005, Johnston *et al*. conducted a review of all studies pertaining to the investigation of teaching gestural signs to prelingual, typically-developing infants. Their inclusion criteria were fairly broad allowing for all types of research method, instruction of BS (e.g. independently at home, or in formally-taught groups), and type of outcome measure (including language reception and production, social and cognitive

development, literacy skills and parent-infant interaction). They included studies of hearing infants of deaf parents (CoDAs) as well as hearing infant-hearing parent dyads (HCHAs), scouring all published output on BS from 1980 to May 2003. From 1208 relevant articles found they discovered that only 17 met with their broadly-based selection criteria. Of these 17, only 8 were original studies, and 5 of these were case-based.

Johnston et al. (2005) concluded that there was little evidence to support BS' claims for advanced language development; although they intimated that this was due to the lack of rigour employed in the studies thus far conducted. For example, the lack of independence between participants in studies who were subsequently re-recruited for follow-up, the lack of comparison control groups, the averaging of scores across wide age ranges, and the non-separation of spontaneously-produced and taught signs were all highlighted as problematic methodological issues. This shows the difficulty in citing previous research, especially when comparing findings and conclusions directly.

Another issue, when investigating infant gesture, stems from the difficulty in ascertaining how certain gestures are interpreted (e.g. as symbolic or not). There has been much controversy surrounding the coding of infant pointing as deictic or as referentially symbolic (e.g. where the infant intends to draw the parent's attention to something in their environment versus the use of a point to stand for 'you', 'me', and so on), as well as confusion over the interpretation of what constitutes early gesture and early sign (e.g. many infants imitate their parent or spontaneously raise their hands in the air when something disappears but this does not necessarily mean that they are symbolically signing 'all gone') (see e.g. Volterra et al., 2006). This may be the reason

why there is still no agreement in studies of BS with hearing infants of Deaf parents that advanced language acquisition occurs (e.g. Brackenbury et al., 2005). Given that BS in the CoDA paradigm is not a keyword augmentative communication system (as used by hearing parents of hearing infants), but is linked to a natural language, such exposure might be anticipated to be more conclusive if the outcome measures were more clearly defined.

Undoubtedly, a concomitant issue is that there are only a few individuals working in the *specific* area of BS. Key researchers remain Acredolo and Goodwyn, who may be credited for starting the research area with HCHAs initially in the 1980s; as well as Vallotton. Others have focused more directly on sign language acquisition in Deaf families, (e.g. Bonvillian; Pettito; and Schick); or on the wider spectrum of gesture development, (Capirci; Goldin-Meadow; Namy; Volterra and their various associates). With this in mind, when looking at studies since the Johnston et al. (2005) review, it is not necessarily the case that results relate to BS directly. For example, in showing a link between infant gesture use at 13-15 months and vocabulary size at 18-20 months (Rowe & Goldin-Meadow, 2009), and links between prelingual gesture and language development generally (Watt et al., 2006), findings are based on a *range* of gestures: deictic and representational. Volterra et al.'s (2006) suggestion that augmentative gesture had a brief effect on representation and communication between 12-15 months, included baby sign but was not based solely on it.

Training in gesture should not be underestimated, however. Rowe and Goldin-Meadow (2009) showed that families of low-SES tended to gesture less with their infants than families with mid- to high-SES. Kirk (2009) found that parents from a low-SES

115

background, when trained to use gesture, improved their infant's receptive and expressive vocabulary. Alternatively, Vallotton (2009) has shown a greater responsiveness amongst caregivers when *children* are taught gestural signs (symbolic gestures based on the Baby Signs Program™) to supplement their speech. Ultimately, the comparative impact of spontaneous versus taught signing, as well as general gestural behaviour versus symbolic gesturing remain unresolved, although the results from Rowe and Goldin-Meadow (2009), as well as those of Kirk (2009), imply that BS could well be beneficial to families where gesture is less spontaneously found.

4.2.1 Clarifying terminology

Taken together, previous BS studies tend not to have a single definition for what constitutes a symbolic gesture/sign. Certainly, if spontaneously produced, a gesture should only become symbolic if it attains an interpersonal meaning which is understood by both parties as representative of a particular entity. For example, there is no more logical reason for an infant to pant to symbolise 'dog' than for the same symbolic gesture to signify 'hot'. However, it is generally more likely to see adults make a 'fanning' gesture to communicate the latter, and it is this that the infant is likely to imitate. The constraint of mutual exclusivity suggests that once a symbol has been allocated to a particular entity, the infant prefers to match one label to one object/event (e.g. Markman et al., 2003). This suggests two things: that a spontaneous symbolic gesture may stem from the parents' modelling and shaping; and that it will maintain its meaning if shared. One nonverbal gesture will not be used for objects/events which are categorically dissimilar, such as for 'hot' and 'dog' above).

Pre-linguistic gestures, proto-imperative and proto-declarative[5], are seen as predictive of later language development. The development in actions, such as showing and giving, as well as in referential pointing, shows the movement from a desire to secure the parent's attention, to a more sophisticated level of intending to communicate something about the external entity. Capone and McGregor (2004) highlighted the strong link between referential pointing and early language. The implication for BS is that symbolic gesturing can reach beyond the current context to enable communication about past and future events, thereby extending the referential point context. For example, Liszkowski et al. (2009) found that prelingual infants at the age of 12-months were able to point towards absent objects which other, non-human species could not.

Ultimately this raises the question whether a gesture spontaneously produced by an infant has increased resonance for him/her (being linked to an implicit[6] mental representation and possibly to links within long-term memory). Above all a spontaneous gesture is within the infant's productive (sensori-motoric) capabilities. In this sense there is a motivation and reward for producing it, especially when it is understood. Alternatively, gestures can be produced simply as a manifestation of affect. An example of a non-linguistic behaviour is the infant's rapid flapping of arms at the sides of her/his torso in excitement or making fists due to frustration or excitement. Of course, if the parent reads intentionality into such an action the initially non-linguistic gesture achieves *interpersonal* meaning over time. Only if the infant's communication is not understood may s/he become demotivated or frustrated at the lack of an appropriate response as s/he anticipates the response based on previous routines and experiences

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[5] See §2.4.1 for more detail
[6] See §1.2

(although see Fagan, 2008, who suggests the infant's motivation for *goal attainment* is the crucial factor). Compare the infant who tries to insert a toy into a receptacle (a visuospatial, motoric learning act) to the child who hides a toy in the same receptacle then looks to the parent smiling, pointing, or clapping (intending for the parent to find it). Intentionality-reading on the part of both interlocutors is crucial to the successful accomplishment of the action taken and this requires intersubjectivity, attention, and predictable expectations of responses according to previous formats. This links to the importance of socio-emotional development mentioned earlier in Chapter 3.

4.2.2 Some specific studies in more detail

In 1985 Acredolo and Goodwyn published results of a case study of a first-born female infant. Findings showed she had a spontaneous vocabulary of 13 symbolic gestures between the ages of 12.5 to 17.5 months which had developed during structured routines with significant others and related not only to objects but to events ('gone') and to states (e.g. 'hot'). In this sense, Acredolo and Goodwyn point out that some of these 'spontaneous' gestures had developed from watching the adult's behaviour during such routines and were associations rather than generated creations. Four spontaneous gestures were not associations with others' behaviours but forms based on direct actions undertaken in relation to certain objects/events ('slide', 'ball', 'swing', 'night night'). This resonates with Nelson's (1974) claim that function is at the root of naming; Werner and Kaplan's postulation that symbol formation is embedded in sensori-motoric action formats; and the emergence of gestures as manifestations of symbolic play.

In addition to these gestures, the infant acquired another 16 symbolic gestures which were taught to her (e.g. 'good', 'drink', 'eat', etc.). The infant then progressed to combining a gesture with a word, and combining gesture with gesture, before graduating to word + word combinations. This combination of gesture + gesture is not a common one found in other BS literature with hearing children (e.g. Butcher & Goldin-Meadow, 2000), and is never seen in typical language development (Capirci et al., 1996) although Doherty-Sneddon (2008) has reported observation of two cases (one unpublished). It is perhaps notable that the infant in the Acredolo study tended only to combine shrugs or raised hands with an object gestural name – actions that are fairly common amongst non-BS infants, too. Acredolo and Goodwyn took their findings as indicative of Werner and Kaplan's hypothesis on sensorimotor behaviours as a basis for early labelling skills.

This seems promising and it might imply that infants can easily develop gestural communication with their parents if encouraged to do so. However, as the child was Acredolo's own, it might be argued that there is an inherent bias in the parental/ psychologist motivation to achieve a positive result; especially in terms of interpreting the gestures. In reality BS may not achieve more than parents who follow joint attention and establish joint acts, or parents who focus on parental sensitivity and establish interpersonal meaning.

In 1988 Acredolo and Goodwyn followed up the case study with a paper entitled 'Symbolic Gesturing in Normal Infants'. There were two new studies: Study 1 was interview-based, had a sample of thirty-eight 17-month-old infants, and focused on maternal responses that provided data on the nonverbal and verbal communication of

their child. Study 2 was longitudinal, involving a sample of sixteen 11-month-old infants. Here, parents maintained diary records of their child's verbal/nonverbal behaviours over a 9-month period. When the infants were 17 months old, laboratory-based measures of imitative behaviour were taken and, at 24-months, measures of verbal vocabulary size, mean length of utterance (MLU) and mental development (MDI from the Bayley Scales of Infant Development) were produced. Findings from these studies showed that girls tended to rely more on gestures than boys (in Study 1 the difference approached statistical significance, in Study 2 it was statistically significant). Such gender differences have also been found in other studies, such as Özçalışkan and Goldin-Meadow (2010); and there are suggestions of further differences caused by birth order effects. Consequently it is vital to account for balanced gender and birth order groups when comparing data.

4.3 Links between gestural labelling and verbal vocabulary

A major issue of contention here is what is meant by 'gestural behaviour' and 'gestural labelling'. Acredolo and Goodwyn (1988) interpreted 'gestural labelling' as an iconic action which represented items like events and objects. They claimed that there was support for a positive relationship between gestural labels and verbal vocabulary development. In 2005 Iverson and Goldin-Meadow looked at three types of gesture: deictic, conventional, and ritualized, used by 10 infants between the ages of 10-14 months. To ensure that these gestures had a communicative function they only coded those which included some element of IJA from the child, and did not involve any direct manipulation of the object or person. These authors found that infants often used a gesture to signify objects before they used the word. As many of these gestures were

in the form of index points, palm points, nods or shakes of the head, and reaches, there is an implication that referential gestural behaviour can be equally supportive of communicative interaction.

In 2008, Rowe et al. measured both deictic and iconic gesture usage (they omitted all ritualized gesturing). They found that child gesture use at 14 months was a significant predictor of vocabulary size at 42 months. As they classed points as deictic, and looked at how these were used in relation to the iconic gestures from the symbolic gesturing in the Acredolo and Goodwyn (1988) Study 1, the suggestion is that gesture *as a whole* can be seen as beneficial to language development, certainly in terms of lexical aggrandisement.

In outlining just three studies, the problems of comparison are highlighted. There is no exact replication of the previous studies and therefore the data reported are not from equivalent measures. Rowe et al. (2008) do not separate out the results for deictic versus the 'iconic' gesturing so it is unclear whether it is the pointing rather than the iconic gesturing that is the significant factor. It is also unclear whether some or all of the iconic gestures were spontaneous or had been taught. As the authors make the point that there is a wide range in gestural use amongst parents (114 gestures to 0 gestures across a 90 minute period) there may be other underlying reasons why some families are less demonstrative in this way than others (such as SES factors, mentioned previously). As Lock et al., (1985) argued that infants do not imitate deictic pointing, is there an alternative reason why some parents use less deixis themselves, and is this indicative of how the infants will use pointing? It would be useful to know more detail to the pointing behaviours used within the Rowe et al., (2008) study.

121

Another aspect to gestural communication was highlighted in the Acredolo and Goodwyn (1988) and Rowe et al. (2008) studies: that of iconicity. Acredolo and Goodwyn (1985) had found that most of the gestures used by the infant in the case study were indexical rather than iconic in nature. Is it possible, therefore, that a beneficial feature within gesture, and an alternative explanation for infants' boosted language development, stems from an iconic awareness? From what age can infants understand iconic gestures?

4.4 Do infants have iconic understanding?

In 2001 Cheek et al. reported on a longitudinal study involving five Deaf and five hearing children. The Deaf infants ranged in age from 5-17 months, the hearing ones 7-13 months. The authors conjectured that there was apparent continuity between spontaneous prelinguistic gestures and early signs, but that difficulties in production, such as handshape and path movement, were likely to stem from *motoric constraints* commensurate with the infant's development. This implied that particular taught signs (in ASL, BSL, or in Baby Sign) may not appear in an infant's productive vocabulary, not due to their non-comprehension of the meanings but to their physical inability to produce them. As seen in hearing children, the errors likely to be observed in language production (sign or speech) are substitutional ones, where the most frequent tokens in babble (manual: e.g. palm orientation down, or vocal: repetition of /d/) occur in the wrong place (BSL sign for 'bed' (flat palm held at the wrong side of a tilted head), or 'doddy' for 'doggy'). This suggests that the infant's sensori-motoric abilities are not as adept as BS sites suggest.

Moreover, Cheek et al.'s (2001) study, threw doubt on the role of iconicity in sign acquisition (for BS based on recognised sign language, or BSL/ASL). This was despite claims from earlier researchers that signs could be *transparently* iconic (Campbell et al., 1992) and that they were easier for *adults* learning sign to remember (Lieberth & Gamble, 1991). Notably, this previous research belies two problems when relating it to infants. Firstly, 'transparency' suggests a link to cultural knowledge or experience and secondly, to memory links developed over a period of time, neither of which infants yet possess. For example, even with signs for 'drink' and 'swim' which seem obvious to adults, an infant has to be able to represent the appropriate absent object and/or the appropriate location/context for these signs to make sense. This is not an automatic skill, as researchers such as Mizuguchi and Sugai, 2002; and Schick, 2006 point out (see §4.5, p 110).

Further indication of the ineffectiveness of iconicity for infants is shown in Cheek et al.'s findings that reported early concepts observed in the 10-word vocabulary of infants were similar *regardless* of their presentation: verbal or manual. If there had been an iconic advantage, lexical acquisition would be expected to be higher in the groups exposed to gestural signs. In terms of production, they also found a similar preference for the same handshapes regardless of hearing status when babbling which implies non-imitation and a natural progression in motor skills' exploitation. Alternatively, an interesting difference they report is an increase in the use of index gestures (i.e. pointing) by the Deaf infants more than the hearing infants - especially when there was a communicative intent. This suggests that iconicity is not a factor in infants learning signs but that referential pointing is.

Tolar et al. (2007) also looked at hearing children and their ability to recognize the symbolic meaning of iconic signs which they had not seen previously. Their study involved 66 hearing children (32 girls and 34 boys) between the ages of 2.5-6.5. These children were allocated to a group according to their age; the youngest three groups had virtually the same number in each (at 2.5 years, $N=$ 14; at 3.0 years, $N=$15; and at 3.5 years, $N=$15). Participants were assessed for their ability to do a symbolic picture test. To complete the task the signs (taken from ASL) had to be matched to pictures of the referents. To assess the role of language proficiency in the development of iconicity, participants were also tested for their level of receptive language. The authors' findings suggested that children below the age of three *did not* recognise the meaning of iconic signs, and even at three this might have been at chance level.

The authors offered potential explanations for their results. One of these relates to the postulation that iconic ability may grow from the infant's initial 'activity schemes' (cf. Werner & Kaplan, 1963). The implication is that a child needs to build *experience* of a referent *whilst it is acted upon* in order for a mental representation to develop: that is, the entire activity of, for example, posting a toy letter is reactivated in the memory before the sign 'letter' is understood. This starts as an associative process that develops into a mental representation at a later cognitive date. This is supportive of an embodied cognition perspective as outlined in §1.6. Alternatively, the role of mirror neurons, which fire equivalent patterns of imitation in the observer of someone else's actions (e.g. Arbib et al., 2000) might enable the infant to perceive parental behaviours as if they were actively undertaking them themselves - but this omits the role of intentionality in the process.

Simcock and DeLoache (2006) investigated what toddlers understood from pictures of real objects, and whether they linked the first to the latter. They suggest that photographs are easier for infants to associate with real objects than drawings, as the features available in a photograph are richer and closer in nature to the real object. This means that the cues which enabled the infant to encode the object originally are more likely to be stimulated by the photograph when retrieving the appropriate representation. This relates to Hayne's representational flexibility hypothesis (ibid, 2006) which argues that as infants increase in age they are able to utilise more memory retrieval cues due to an increase in number, or subtlety, of attributes available within memory systems as well as to greater organizational efficiency within the systems themselves (e.g. Herbert & Hayne, 2000). Activating a specific activity scheme within a routine would allow for a representation to be embedded and recalled more readily, especially if the same toy is used in the same context.

4.5 If not by iconicity how might infants learn to categorize and label?

Clearly the brain's self-organization in terms of schemes, hierarchies and associations facilitates efficient storage and access to related links and information far more rapidly than a system which consists of individual, discrete pieces of data. As a consequence, the level of direct matching between a particular object and a representation of it is less beneficial than a burgeoning recognition of patterns, commonalities and differences across many objects and events in the environment. This is especially important during early infancy. Such organization streamlines the way we interact with and understand our physical and social world.

Thus, when infants begin to label objects/events it is believed that they do so via a categorization system (Markman, 1992). Subsequent researchers have suggested that this system divides into three types of categorization: one based on properties, such as shape/function; one based on actions; and one based on spatial relationships (Cohen & Brunt, 2009). Examples of each are illustrated by Gershkoff-Stowe and Smith's (2004) study which is related in more detail below; Streri and Féron's (2005) study, which implies that infants are able to categorize objects purely haptically before visual perception is established (up to 5 months in age), and therefore before mouthing occurs; and by Quinn (2004) who found that 3-4 month olds not only categorize above and below spatial relations but are capable of doing so for left and right too.

Naturally, categorization is only half of the problem. An infant must still link a categorization representation s/he has with the appropriate label. In 1995 Waxman and Markow claimed that early categorization might depend on associating *verbal* labels with objects by focusing the infant's *attention* on a targeted object. Others suggested that individual features, such as eyes, might be a focus for categorization rather than an object's gestalt (e.g. Quinn & Eimas, 1997). This did not appear to develop until around the 24-month mark (Imai et al., 1994). Alternatively, other researchers claim links between early attentionality to shape and lexical acquisition, especially of nouns (Smith et al., 2002). In any of these illustrations, the infant's ability to perceive, explore, and attend to the object is crucial. The question arises whether an augmentative communication intervention consolidates such targeted focus, especially where other forms of gesture are less evident?

126

In 2004, Gershkoff-Stowe and Smith looked at whether there was any support for a link between vocabulary acquisition and shape recognition. Eight infants (4 female, 4 male) were recruited at the age of 15 months from a larger study and before they had a productive vocabulary of 25 words. Parents were asked to keep a diary of their infant's lexical production, noting which new words emerged and the context in which this occurred. When they reached a productive vocabulary of 75-100 words, the experiment stopped. Acceptable words included those recognised by the family but not found in standard vocabularies (e.g. 'bobo' for 'bottle').

By omitting all proper nouns the researchers re-presented the list of nouns to the parents and asked them to define each word according to how they thought their infant had categorized them (by colour, shape, or material composition). They did not bias these definitions but based their codings on the agreement of participants (16/20 parents had to agree on the categorization). They found that the first words acquired were all for objects similar in shape, and that the infants became increasingly attentive to shape as their vocabularies progressed (over three periods: when infants had a productive vocabulary of 0-25 words; 25-50 words; and 51+ words). They also found a link between the rate of vocabulary acquisition and attention to shape, where associations to composition and colour reduced but shape increased. A similar study was conducted by Graham and Diesendruck (2009). They found similar results in 15-month olds who selected similar novel objects based on shape over colour and texture.

These findings are important within the current study as a gestural-based language system will consist of some iconic signs, including shape. If infants in this group show a bias towards shape-oriented word acquisition and the production of a shape-oriented

127

sign lexicon, this would provide support for arguments of categorization centred on geon recognition (Biedermann, 1987) or attention to affordances (Rosch, 1973). Moreover, the distinction between function and shape may in fact be unnecessary as Gershkoff-Stowe and Smith also cite neural imaging studies which suggest a link between 'object recognition and the motor areas involved in acting on objects' for adults (2004, p 1111).

Alternatively, in research with deaf children using ASL, Schick (2006) concluded that deaf children are 8-9 years in age before they accomplish the classifier system, of which SASS (Size and Shape Signifiers) is a part. She clarifies that this is on a productive basis only, stating that deaf children do not have difficulty with the *concept* of classification per se. Thus, it appears that productive problems for deaf children are likely to be connected to the complexity of sign syntax, with issues of placement, directionality, and representing multiply-inhabited scenes (fore and background, etc.) being key. This is not the issue for infants using BS, although other elements are.

Schick continues that of the three types of classifier (semantic representation (entity); how someone acts upon an object (handle); and the representation of the object in visual geometric properties (shape and size)) it is the handling classifier that is inconsistently evident in deaf infants, as early as the age of two. This may be what is seen in hearing infants gesturing 'hairbrush'. This could then be coupled with findings (cf. Mizuguchi & Sugai, 2002) that children use a body-part-as-object (BPO) to denote a missing object in early symbolic gesturing (e.g. the index finger for a toothbrush) before changing to an imaginary object gesture (e.g. curving the hand to imitate the action without the need for a placeholder object). This might signify that embodied cognition based on motoric

128

schemata may underlie such symbolic representational ability rather than imitation or iconicity. This means that the entity is still linked to the infant, in terms of sensori-motoric actions upon it and therefore cannot be defined as a discrete symbolic entity represented in its own right.

4.6 The different faces of BS

How do these distinctions impact on the way BS is used? It tends to have two guises: firstly, communication through enhanced gesture (action-based, no linguistic antecedent), and secondly, communication through the adoption of signs from recognised languages of Deaf people (American Sign Language (ASL) or British Sign Language (BSL)). Thus, there is a different basis for the gestural components (action versus iconicity/symbolism). Whilst, in each case, BS is used simultaneously with the spoken equivalents, the type of gesture involved is markedly different.

To illustrate the first of these approaches, infants are encouraged and taught to use a system of 'symbolic' action-based gestures, like sniffing for a 'flower'; or panting to signify a 'dog'. The system developed from observations that infants produce spontaneous signs when interacting with a parent (Acredolo & Goodwyn, 1985) and, whilst some parents do adopt spontaneous signs initiated by their infant, there are now several teaching packs which have become available for parents to follow, either as part of a class or independently. In 1987, Garcia added to the debate when he found that hearing babies of Deaf parents had advanced language skills at an earlier age (www.smalltalklearning.com/research/studies.html). As has been noted earlier in this thesis there is some controversy regarding such a claim, in terms of acquisition

129

timescales, complexity of language skills and symbolism. Goodwyn and Acredolo (1993) purported to find supportive results for Garcia's statement but again this was based on action gestures rather than ASL/BSL signs, therefore comparisons with deaf infants cannot be drawn. Above all, cause and effect cannot be singled out here as it is not possible to tease out the signing per se as the cause of any change, as opposed to the composite attention-gaining skills of the parent (such as increased use of pointing, tactile communication, and facial expression).

Nevertheless, as a result of Garcia's findings, there has been an increasing interest in establishing BS teaching based on recognised sign languages. Two 2007 studies have also suggested that typically-developing hearing infants (not previously exposed to ASL) can utilise certain features of it: to facilitate socioemotional succour (Thompson et al., 2007); and to detect information presented in terms of sign location and facial expression (Wilbourn & Casasola, 2007). Thus this type of BS is interesting to investigate from both a linguistic and socioemotional perspective. As an approach it adopts lexical items from recognised sign languages such as ASL (American Sign Language) or BSL (British Sign Language). Generally these are not equivalent to the full adult forms of these cultural languages, and therefore elements such as multi-channel signs, symbolic/referential pointing, facial expressions, and topic comment structures are not included. However, Deaf parents of deaf infants do not initially include these elements when signing either, although they are much more aware of visual attention, signing within the infant's attentional space, deixis, repetition, pace, and exaggeration of signing (Spencer & Harris, 2006). For the current study it was decided to look at how BSL impacts on infant development. Consequently this group

was referred to as "Baby *Sign*" rather than as enhanced gesture with the signs used being more than action-formats, having a recognised sociocultural, symbolic basis.

Whilst Garcia has gone on to develop a baby signing course based on ASL (www.sign2me.com), his and most of the other materials available for ASL/BSL baby signs are in book form which raises one of the difficulties for parents using them – it translates a 3-dimensional gesture into a 2-dimensional form. In this way, dynamic elements such as facial expression, movement through space, body language, repetition, and point combinations are lost. In order to address this difficulty, the current studies incorporated a combination of 2-dimensional photographs, 3-dimensional signs on DVD, and signing in situ with the parent and infant.

Moreover, as most of the previous research has been conducted on BS alone, any claims cannot be compared against equivalent developments amongst infants receiving a different type of intervention, as well as against a non-intervention control. By doing a cross-comparison, it should be possible to highlight whether intervention per se is beneficial, or whether BS enhances the interactions over and above others. This was the aim of the current study. Further explication, as well as definition of the comparison intervention methods used, is outlined in Chapter 5.

4.7 Multimodal cue redundancy

Bahrick and Lickliter's (2000) theory was introduced earlier. It suggests that infants require multimodal presentation of information in order to synthesise their sensori-motoric experiences. They hypothesise that the infant focuses on a predominant mode

but uses information from the other senses to interpret the event. Of interest in the present study is whether BS presented in BSL format conflicts with this need for a dominant focus, or whether it enhances the overall experience. The chosen intervention strategies enable investigation of the premises of the different aspects outlined in the theories mentioned in Chapter 1.

4.8 What does BS signify to the infant?

As the current study was focused on conventional signs from British Sign Language (BSL), it was possible to investigate the types of signs emerging as related to all of these perspectives. Do infants acquire signs on the basis of the *action*, gesturing 'go' and 'again' as a quick downward action, with no difference in the handshape to differentiate meaning; or on the basis of the *iconic potential* presented via a sign lexicon – where handshape, especially indicating size, shape, or function is important (e.g. 'brush')? Equally, was the *spontaneous* generation of symbolic gesture by the child more crucial than the *modelling/elicitation* of such gesture *to* the child?

To conclude, there are many ways to analyse language acquisition and development. Each of the interventions highlighted here have a role to play in how the process(es) may be evaluated. By looking at verbal and nonverbal interactions over time, just how some of these processes come into play, is of interest: both in terms of prelinguistic infants and older children affected by a communicative/environmental deficit. Chapter 5 begins to outline the longitudinal study undertaken in this thesis, initially providing an overview of recruitment, the selected interventions, and group allocation methods. As there were attrition issues, measures to deal with these are also highlighted.

Chapter 5: General Methods for Longitudinal Study: Comparison of Intervention Techniques

A longitudinal study of infants, commencing between the ages of 9-11 months, was conducted over a period of 20 months. Its purpose was to compare the effects of different types of communication intervention strategy (Baby Sign, Enhanced Verbal input, and Enhanced Nonverbal input) and assess these, not only against each other, but against a non-intervention group. The study focused on elements of language acquisition (phrase and single word comprehension, phrase and single word production, gesture use and syntax development), as well as on socio-emotional development and attachment behaviours. Formal measures used for these purposes included the MacArthur Bates Communication Development Inventories, the Ages and Stages Questionnaire: Socio-emotional, and the Attachment Q-Sort. The study was extremely complex therefore it is important to establish an overview before defining methods for each specific component. There is an explication of the generic methodology employed throughout here. Specific details applied to language and gesture, as well as to the socio-emotional measures are set out in the relevant following chapters.

5.1 Overview

Figure 1 shows a Gantt chart representing various undertakings conducted during the course of the study and their duration (as number of days). It depicts the overlap and flow of these tasks, and outlines the re-recruitment stages due to attrition often experienced in longitudinal studies.

Figure 1: An Overview of Tasks Undertaken in Relation to the Longitudinal Study
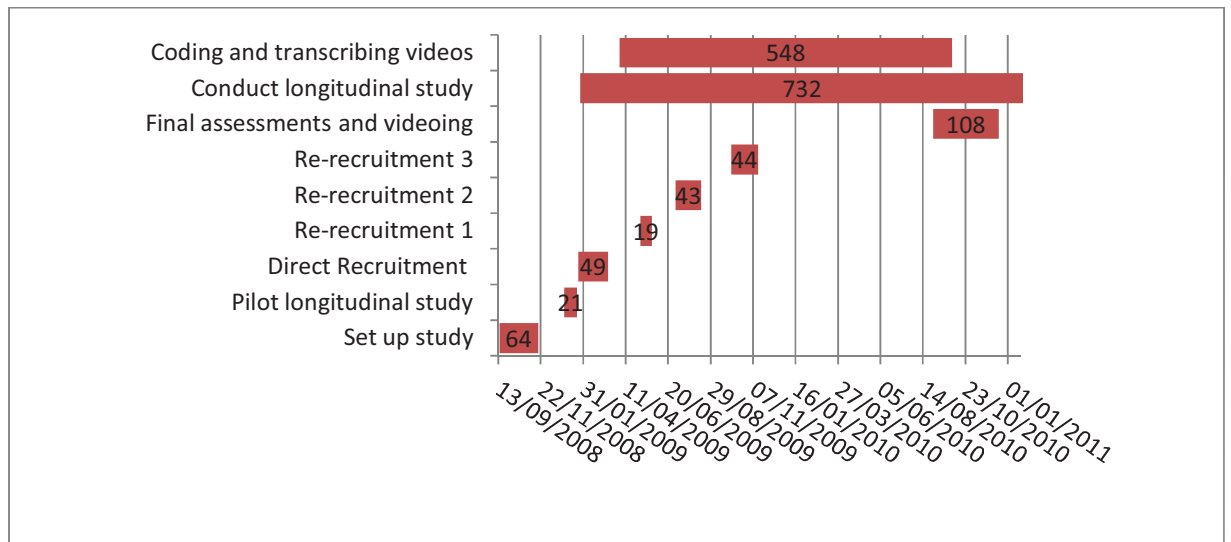
5.2 Participants

Seventy children (39 males, 31 females) aged 9-11 months were recruited over a period of eleven months. Three infants were bilingual: two of these were in the Baby Sign group, one in the Enhanced Verbal.

5.2.1 The Interventions

Baby Sign supplements typical parental speech by adding simultaneous representational gestures for key words. A variety of approaches can be used (see Chapter 4, §4.6, p 111). Proponents of BS claim that the technique encourages earlier language production, larger vocabularies and promotes self-confidence (e.g. www.babysigners.co.uk). They base their assertions on several studies (cf. Chapter 4, §4.2.2). However previous results are ambiguous, as some studies have been based on single cases (such as Acredolo & Goodwyn, 1985; Capirci, Volterra & Montanari, 1998; and Caselli, 1990); have focused only on female participants (Acredolo &

Goodwyn, 1985); have included non-independent groups (Capirci, Iverson, Pizzuto, & Volterra, 1996); have not cited effect sizes or power levels; and have failed to compare BS with other types of intervention.

These issues are problematic as individual differences may create significant effects in small samples (see Chapter 4, §4.2.2). It is a recognised difficulty in any study of language acquisition that sample sizes tend to be small due to the intensity of time and effort involved (e.g. Bates et al., 1995).The current thesis studies used original participants, and attempted to maintain larger groups across the time-points to minimise some of these issues.

Parents of infants allocated to the Baby Sign group (BS) in the current thesis study were requested to learn and use a set of age-appropriate baby signs based on signs from several BSL dialects (see Appendix 2). Usage was encouraged to reflect typical communicative interactions between Deaf parents of deaf infants (DPDC) which show a tendency to use a higher number of repetitions, and predicate forms (Spencer & Harris, 2006). In practice this means that Deaf parents tend not to introduce syntactic elements, such as classifiers, placement, or multi-channel signs, etc. before the child is 2.5 years of age (ibid, 2006). By using more predicates, Deaf parents tend to use verbs in their citation forms along with nouns but they accompany them with points to clarify meaning (Hoiting, 2006).

As language acquisition occurs in social interaction with others, the quality of parental input is important to consider. Repetition is used frequently by a range of parents as it enables infants to seize meaning from a variety of cues. If a new meaning is presented

only once the context needs to be clear and the infant needs to attend fully to it, whilst possessing the ability to recognise and either store it for the first time or link it to previous knowledge. How much repetition was used across the groups was therefore worth investigation. Would BS as an intervention impact on parental communicative behaviour more than any other? Again, it is important to emphasise that the BS group knew they were not learning BSL per se as they were not employing any syntactic structure to their signs in context (for example, facial and upper body markers for questions or imperatives, or a topic-comment structure), but any impact on behaviour might indicate an *implicit* change due to their viewing BS as a *system* rather than as discrete gestures.

Signs for the study had been chosen from several BSL dialects to disambiguate possible confusions that might arise. Examples of this selection include using the Scottish sign for 'dog' (to help differentiation with 'wait'), and 'mummy' signed on the hand to differentiate from the propensity of adults to sign 'hat' one-handed. Advice was given regarding the necessity to use the signs consistently and clearly, to endeavour to involve the extended family in their usage, and to ensure that they had their infant's visual attention prior to any sign production.

5.2.2 Comparison interventions: Enhanced verbal input

Enhanced verbal input was chosen as a comparative group as it is a familiar interactional method, also with a proven facilitative record (Singh et al., 2002). Based on infant-directed speech (IDS/'parentese'/ 'motherese'), this was selected because, whilst there is a tendency for adults and even young children to talk to infants in a child-

centred manner (Sachs & Devin, 1976), it is not a universal behaviour pattern (Singh et al., 2002). It is a child-centred approach to communication and interaction and has its foundations in the work of Snow (1972). It includes awareness of supra-segmental features of speech utterances, such as the rhythm, pitch, and pace, as well as reflection upon output in terms of elongated vowels ('horsey' instead of 'horse'), and usage of simpler, shorter sentences. Indeed, Thiessen et al. (2005) showed that infant-directed speech helped infants to segment words, although Cunillera et al. (2010) suggested that the addition of visual cues was beneficial.

IDS is used within the wider framework of language output that the infant is exposed to. There is recognition that it plays a role in cueing the infant to communication but that adult-directed speech also impacts on the infant's communicative competence (Soderstrom, 2007). This indicates that parents do not use IDS *all* of the time around their infant but often target it during dyadic play interactions. Importantly, as natural gesture is an integral part of IDS, nonverbal behaviours such as pointing, waving, showing, shrugging, etc. are associated multimodal cues. For example, Gogate et al. (2000) found that mothers often synchronised targeted words to their prelingual infants whilst moving the relevant objects into their line of sight, and that this synchronisation reduced as the infants became more verbal.

Of course, some parents use natural gesture more than others. Namy et al. (2000) found that in groups of sign-trained parents and in controls, there was a range of 1-71 and 1-69 gestures used respectively. This implies that there might be a major difference amongst any parents when interacting with their infant, even regardless of whether they are learning BS or not.

137

The Enhanced Verbal group for this study differed from that set up by Goodwyn et al. (2000) and Kirk (2009) in that it did not ask the parents to focus specifically on labelling. Such a focus assumes the same premise as BS: that the infants have early symbolic development and are therefore able to relate a label to an object/event and its representation. By looking at the wider aspects of infant-directed speech, including rhythm and pitch patterning, the specific onus on symbolic functioning was removed and a bigger concentration placed on the interactional context. By using the wider techniques of IDS, this group was given the best possible platform to perform optimally.

In addition to the role of IDS, it was also assumed that there might be a role for the overall amount of parental speech directed to the infants. Hurtado et al. (2008) suggested that mothers who had a larger output to infants when the latter were 18-months old, had infants at 24-months who knew more words and were quicker at processing words in word recognition tasks. Tomasello and Farrar (1986) had focused this more directly previously by reporting that the talk *within* the joint attention format was more crucial than that which occurred outwith it. They also found that parents produced shorter but more utterances within the JA frameworks, predominantly comments rather than questions. This suggests the type of language parents use, the timing and context are all important components in the language acquisition process. It was of interest to investigate whether different types of intervention had an effect on the type and amount of parental speech produced.

5.2.3 Comparison interventions: Enhanced Nonverbal input

The second comparison intervention was chosen as it was based more on nonverbal behaviours. The premise of the theory here is embedded in Bloom's (2001) Intentionality Model and Language Acquisition which states that three aspects underpin language development: that language is not a domain-specific skill but rather is integrated into a domain-general schema, thereby influencing and being influenced by changes in other developmental areas (such as motor, cognitive, and social-emotional); that infants' acquisition of language and other developmental skills originate from their intentionality and action (thereby implying that infants have a conscious awareness and representation of social and physical objects in their world which they behave towards in a goal-directed manner); and that a tension between their engagement and effort during this goal-directed behaviour impels them onwards to develop and progress in both their cognitive and communicative endeavours.

In real terms the emphasis of the theory diverges from that employed in the other two in that it emphasises the infant's dynamic and "*impelling*" role in language acquisition as opposed to the co-constructive foundation recognised in more socially-based theories. Put another way, whilst the theory recognises that interactions are co-constructed by parent and child it implies that the impetus for such construction stems from the *infant* not the parent, nor the interaction itself.

Bloom suggests that the infant *demands* a particular type of scaffolding due to his/her own conscious biases towards objects, social or physical, as s/he experiences them in the external world. This is closer to Piagetian, and therefore constructivist, thinking. It

differs from social theories, such as that of the Zone of Proximal Development (Vygotsky, 1962) or scaffolding (Wood, Bruner, & Ross, 1976) which suggest that parental sensitivity (conscious or otherwise) to the infant's level of understanding is the source of the infant's progression from one level of understanding to another. Crucially this sensitivity originates from the joint experiences and co-constructed meanings the parent and infant create *together* in the context of play and interaction.

By including this group, it was possible to investigate how attention to nonverbal communication might affect the interactions between parent and infant. It set the focus on the nonverbal elements of the language acquisition process, not just pointing but the finer aspects of body language, such as facial expression and body orientation which may otherwise be overlooked. According to Bloom's theory, the infant would direct the interactions, driving them towards infant-selected goals, and this should be evident in the balance between following and initiating joint attention patterns.

Parents in the enhanced nonverbal group were given an overview of the theory. They were asked to reflect on their infant's nonverbal behaviours during play, especially their facial expressions and body language, and to comment on these to the child if appropriate. They were asked to follow their child's point of interest and give commentary to what they were doing in situ. Again they were not impeded from using natural gesture during interactions.

5.3 Recruitment

Extended recruitment was essential to counteract attrition, a common problem in longitudinal studies (Haring et al., 2009). Recruitment methods and attrition difficulties are described in more detail below.

Initial approaches for participants were made by asking local authority and independent pre-school organisations, including SureStart, NHS health visiting managers, the Scottish Preschool Play Association, Bookstart, individual mother and toddler groups, and private playgroups and nurseries for permission to place posters and flyers advertising the study in their various establishments. This initial period accrued 16 participants. A second wave of recruitment was conducted via the internet, specifically the *Netmums* website, the University of Stirling portal, and through local groups of the National Childbirth Trust. This second wave stimulated a lot of interest amongst parents, and resulted in an additional 21 participants. Twelve more participants were recruited due to a snowballing effect amongst parents already in the study. Attrition necessitated three waves of re-recruitment, all occurring via the internet sites. This resulted in a further 21 participants.

5.3.1 Attrition and re-recruitment

Whilst being a common feature of longitudinal studies, attrition can have a substantial effect on the internal validity of a study, especially if the amount rises to a substantial percentage of the total. Attrition is a key cause of missing data. Missing data can seriously bias the interpretation of the findings, as well as reduce the overall statistical power of the analyses (Barry, 2005). As a result missing data cannot be ignored. In the

141

current study, five participants withdrew before any formal visits commenced but three

of these opted for the non-intervention group due to time constraints. These three

subsequently withdrew from the Non-intervention group before the baseline. Five

further participants withdrew from the BS and three from the EV groups after the

baseline point. One withdrew at baseline but provided no data. These events

necessitated three stages of re-recruitment to ensure the groups remained viable in terms

of size. Re-recruitment occurred over the first eleven months of the study. The number

of participants recruited from these stages is shown below:

Phase 1: Apr - Jun, 2009 (12 new recruits)

Phase 2: July - Aug, 2009 (3 recruits)

Phase 3: Oct - Nov, 2009 (6 recruits)

To clarify the pattern of withdrawal, the information is shown below in Table 1.

Table 1: Pattern of participant withdrawal across the longitudinal study

Participants	Male (Total) 39 BS = 12, EV = 8, ENV = 9, Non-intervention = 10	Female (Total) 31 BS = 9, EV = 10, ENV = 8, Non-intervention = 4
Withdrawals (after initial visit – no data collected)	4(2 F, 2M) from ENV	
Withdrawals at Baseline	6 (1 F, 5 M) from BS 5 (4 F, 1 M) from EV (no data available for 1F) 1 (M) from ENV 1 (F) from Non-intervention group (data incomplete)	
Withdrawals at TP1	1 (F) from BS 1 (F) from ENV	
Withdrawals at TP2	1 (F) from Non-intervention group	
Number of re-recruitment drives and withdrawals (NB the following figures are **incorporated** into the time-point totals given above)		
Withdrawals from Phase 1 re-recruitment (Apr-Jun 2009, 12 total)	1 from BS 1 from EV 1 from ENV	
Withdrawals from Phase 2 re-recruitment (Jul-Aug 2009, 3 total)	1 from BS	
Withdrawals from Phase 3 re-recruitment (Oct-Nov, 2009, 6 total)	1 from EV 2 from ENV	
Total withdrawals	Male 9	Female 11

Of the 20 who withdrew over the entire study, twelve voluntarily cited work or health issues. Parental input required in this study was high, and so withdrawals were anticipated, especially in the early stages. Two further parents expressed discomfort in using BS, saying that it did not feel intuitive to them. Two parents wished to self-select BS as their chosen intervention. As random group allocation was desired (in order to avoid bias effects) these requests could not be met.

At the end of the study, data were available for 51 infants (30 males, 21 females). Group composition was as follows: BS (M = 7, F = 7), EV (M = 7, F = 6), ENV (M = 6, F = 6), and the Non-intervention group (M = 10, F = 2). This gave an overall attrition rate of 27.14%.

Several attempts (via Ebsco, Google Scholar, Medline, Pubmed, Stirgate, and Web of Science) were made to find the average attrition rate in previous longitudinal language studies. As the longitudinal study had employed the MacArthur Bates CDI measure (see §6.6) for language development, searches focused on this. However, it was found that attrition rates for these were rarely cited. In non-MCDI studies, percentages varied considerably. The lowest found was 16.44% (Reilly et al., 2010), which was conducted from 8 months to 4 years of age. However, this was a large clinical trial starting with 1910 children and finishing with 1596. In a similarly large study by Lung et al., 2011, following infants from 6 to 36 months, there was a 21% attrition rate (1620/2048 participants). Other studies cite respective attrition rates of 25%, 30%, and >30% (e.g. Bhutta et al., 2002; Crnic et al., 1983; and Landry et al., 1987). Attrition rates cited specifically in infant gesture studies include those from the Acredolo & Goodwyn (2000) who had respective losses of 41% for gesture-trained infants and 35% of control children. Overall, then, the current longitudinal study was within the typical range for average attrition.

5.4 Group Allocation

Parents were advised that children would be allocated randomly to one of three groups: Baby Signing (BS), Enhanced Verbal (EV) or Enhanced Nonverbal (ENV).

Participation was required for a period of 20 consecutive months. Written consent was sought and obtained from all participants before intervention commenced.

A fourth non-intervention group was added two months after the initial recruitment drive and consisted of parents who had expressed an interest in taking part in the study but felt that they could not participate fully (in terms of time). As such this group was not randomized but had self-selected. As the majority of parents in the group worked full-time, and expressed a desire for no visits from the researcher, they completed formal assessments by post only. The researcher made no suggestions as to vocabulary, types and/or duration of play therefore parents received no specific guidance from her. This group was established to look at how direct teaching intervention compared to a non-intervention group. There was no question over the non-intervention group's motivation to contribute but it was of interest whether direct contact produced higher percentile scores. Given that many intervention techniques are now web-based, or available in multi-media format, it was predicted that direct contact would have a greater impact overall.

Total numbers recruited to each group over the course of the study were as follows: BS: $N = 21$; EV: $N = 18$; ENV: $N = 17$; and the non-intervention group: $N = 14$. Loss of participants from the later recruitments had a larger impact on the ENV and EV groups than on the BS due to the ratio of numbers. It had been hoped to check for any potential bias in the data of those who had withdrawn (e.g. if there had been underlying developmental issues) but only six (2 males and 4 females) of the 16 withdrawals from baseline onwards completed formal assessments voluntarily at the end of the study (Time Point 3 (TP3)). Participants who had provided information for a minimum of

three time-points, at least two of these being consecutive, were included in the final data analyses. This meant that final groups consisted of BS = 14; EV = 13; ENV = 12; and the Non-intervention group = 12; a total of 51.

Dealing with missing data

Being a longitudinal study, attrition and missing data are hazards to overcome. Several methods were considered to do this, including listwise deletion, mean substitution, maximum likelihood estimation, Expectation Maximization (EM), multiple regression, single imputation, and multiple imputation formats. Listwise deletion was not an option due to the number of missing datum points, the fact that the study occurred over several time points, and therefore the concomitant loss of power. Mean substitution was discounted as individual differences between infants can vary widely for language acquisition and development (comprehension and production) and this would bias the results by reducing the variance between and within variables (Wayman, 2003). Maximum likelihood estimation and EM are sophisticated statistical analyses, the latter involving bootstrapping (ibid, 2003), and these were beyond the researcher's skill level. Single imputation was not feasible due to the amount of missing data (> 5%). Multiple imputation (MI) was chosen as it maintained natural variance in the missing data by considering why certain data were missing, and how these missing data correlated to the recorded data (ibid, 2003, p4). This variance is held random due to the number of times the imputations are made. In the longitudinal study for this thesis, imputations for each variable were conducted 10 times.

5.5 Parental Background Questionnaire

Previous research has shown that variables, such as socio-economic status (SES) and parental social support networks might have a contributory effect on infant language acquisition and development (e.g. Crnic & Greenberg, 1987; McLoyd, 1998), although SES effects are controversial (e.g. Wells, 1986). In any study of language acquisition and development it was prudent to control for such issues where possible. There were, however, many potential confounds to choose from. For the current study, the following were selected due to the findings of previous researchers working with this age range which suggested that these areas could have the greatest impact (cf. Berglund et al., 2005; Choudhury et al., 2007; Pevalin et al. 2003; and Roberts et al., 1999):

- dual or single-parenting,

- parental educational attainment,

- parental smoking,

- breastfeeding,

- history of familial SLI,

- availability of the extended family,

- work pattern of the primary caregiver,

- birth order,

- perinatal and early infancy health issues,

- and playgroup attendance.

By being aware of the possible influence of the above effects, especially if there were discernible differences amongst the groups, the current study aimed to account for some

of the methodological weaknesses in previous studies. A copy of the questionnaire can

be found as Appendix 1. The information received is shown in Table 2 below.

Table 2: Parental Background Information via Questionnaire

Group	BS (*N*=14) M = 7, F = 7	EV (*N*=13) M= 7 , F = 6	ENV (*N*=12) M = 6. F = 6	Non-Intervention (*N*=12) M =10, F = 2	Total (*N*=51) M = 30, F = 21
Parental Educational Attainment	1.07 (*SD* = 0.27)	1.23 (*SD* = 0.44)	1.08 (*SD* = 0.29)	1.00 (*SD* = 0.00)	1.10 (*SD* = 0.30)
Family History of SLI	1.86 (*SD* = 0.36)	1.54 (*SD* = 0.52)	1.92 (*SD* = 0.29)	1.92 (*SD* = 0.29)	1.80 (*SD*= 0.40)
Parental Smoking	1.86 (*SD* = 0.36)	1.85 (*SD* = 0.38)	2.00 (*SD* = 0.00)	2.00 (*SD* = 0.00)	1.92 (*SD* = 0.27)
Birth Order of Participant Child	1.43 (*SD* = 0.65)	1.54 (*SD* = 0.66)	1.58 (*SD* = 0.67)	1.58 (*SD* = 0.79)	1.53 (*SD* = 0.67)
Breast-feeding	1.07 (*SD* = 0.27)	1.69 (*SD* = 0.95)	1.08 (*SD* = 0.29)	1.33 (*SD* = 0.78)	1.29 (*SD* = 0.67)
Primary Carer Works	2.21 (*SD* = 0.43)	2.31 (*SD* = 0.48)	2.08 (*SD* = 0.52)	1.92 (*SD* = 0.67)	2.14 (*SD* = 0.53)
Early health issues	1.86 (*SD* = .36)	1.62 (*SD* = .51)	1.83 (*SD* = .39)	1.83 (*SD* = .39)	1.78 (*SD* = .42)
Dual parents	1.00 (*SD* = .00)	1.00 (*SD* = .00)	1.00 (*SD* = .00)	1.00 (*SD* = .00)	1.00 (*SD* = .00)
Childminder/ playgroup	3.36 (*SD* = 1.69)	3.62 (*SD* = 1.39)	3.08 (*SD* = 1.17)	4.25 (*SD* = .62)	3.57 (*SD* = 1.33)
Extended family availability	2.36 (*SD* = 1.15)	2.00 (*SD* = 1.29)	2.50 (*SD* = 1.09)	2.25 (*SD* = 1.22)	2.27 (*SD* = 1.17)

Key: Parental Educational Attainment:-

1 = at least one parent has been educated to HE standard

2 = at least one parent has been educated to FE standard

3 = at least one parent has been educated to Secondary School Standard

Family History of Specific Language Impairment (SLI):-

1 = yes

2 = no

Parental Smoking:-

1= yes

2= no

Birth Order of Participant Child:-

1 = first-born

2 = second-born

3 = third-born

4 = more than the third-born

Breastfeeding:-

1 = yes

2 = for only a few days or weeks

3 = no

Primary Carer Works:-

1 = full-time

2 = part-time

3 = no.

Early Health Issues:-

1= yes

2 = no

Dual parenting:-

1 = yes

2 = no

Attends childminder/playgroup (when form completed):-

1 = < 5hours per week

2 = 6-10 hours per week

3 = 11-20 hours per week

4 = > 21 hours per week

5 = none

Extended family availability:-

1 = daily

2 = weekly

3 = monthly

4 = holidays only

5 = n/a

Table 2 shows that the parents were predominantly of high SES-status and infants were in households with both parents. It also shows that most infants were spending a minimum of 11 hours with a childminder or in a playgroup/nursery. One-way ANOVAs were conducted for the families who had remained in the study for at least 3 time-points. Group was the between-participant variable. One of the above categories was statistically significant: familial history of SLi: $F_{BF}(3, 37.44) = 2.98$, $p = .044$, $\eta^2 = 0.14$, $\delta = 0.71$. Post-hoc analyses were consequently conducted. A Bonferroni comparison showed a trend towards differences between the EV and ENV group as well as one between the EV and the Non-intervention group respectively ($p = .1$; EV mean = 1.54; ENV mean = 1.92; Non-intervention mean = 1.92. BS mean = 1.86). These trends implicated a higher level of SLI history in the EV group than in the other two. Previous analyses of the 58 parents who provided full data for this questionnaire showed this more clearly ($p = .045$ between each of these two pairings again in the direction of greater SLI historical incidence in the EV group).

It was also important to attempt control of the mean ages in each group. This was affected by attrition. The mean age for each group for each Time Point (TP) is given in Table 3 below.

Table 3: Mean Age in Months of Participants per Group across MacArthur Bates CDI
Four Time-Points

Group	Mean Age (Baseline)	Mean Age (TP 1)	Mean Age (TP 2)	Mean Age (TP 3)
Baby Sign (BS) M=7, F=7	9.93 (*SD* 0.92) *N* = 14	14.21 (*SD* 1.58) *N* = 14	19.00 (*SD* 1.41) *N* = 14	24.29 (*SD* 2.23) *N* = 14
Enhanced Verbal (EV) M=7, F=6	9.77 (*SD* 0.83) *N* = 13	14.23 (*SD* 1.36) *N* = 13	18.82 (*SD* 1.42) *N* = 13	23.92 (*SD* 1.38) *N* = 13
Nonverbal (ENV) M=6, F=6	9.92 (*SD* 1.51) *N*=12	14.04 (*SD* 1.51) *N* = 12	19.11 (*SD* 2.05) *N* = 12	24.34 (*SD* 2.23) *N* = 12
Non-intervention M=10, F=2	10.67 (*SD* 1.61) *N* = 12	16.17 (*SD* 1.70) *N* = 12	20.33 (*SD* 1.83) *N* = 12	24.83 (*SD* 1.90) *N* = 12
Total M=30, F=21	10.06 (*SD* 1.26) *N* = 51	14.64 (*SD* 1.72) *N* = 51	19.29 (*SD* 1.74) *N* = 51	24.33 (*SD* 1.94) *N* = 51

A two-way ANOVA with between-participant factor: Group (4 levels) and within-participant factor: Time-Point (4 levels) showed that there was a significant main effect of Time-Point (TP): $F(3, 47) = 5.22$, $p = 0.003$, $\eta^2 = 0.12$, $\delta = 0.86$, with children's age significantly increasing across time-point. There was no main effect of Group and no interaction between Group and Time-Point.

5.6 Interrater reliability

Within the longitudinal study for language development, an interrater looked at the data for parental gesture, parental verbal imitation, parental attention-getting, and parental nonverbal imitation. There were significant correlations between the researcher and IOR for parental gesture: $r = 0.99$, $N = 6$, $p < .001$; for parental verbal imitation: $r = 0.95$, $N = 6$, $p = .004$; for parental attention-getting: $r = 1.00$, $N = 6$, $p < .001$ and for parental

nonverbal imitation: $r = 0.99$, $N = 8$, $p < .001$. For child nonverbal behaviours there were

significant correlations for child verbal imitation: $r = 0.88$, $N = 6$, $p = 0.02$; and for child

nonverbal imitation: $r = 0.86$, $N = 6$, $p = 0.03$.

Interrater reliability was also carried out on a sample of the attachment behaviours'

data. Two interraters viewed and coded these from the full videoed play sessions (a

minimum of 3 hours per infant), amounting to 16% ($N = 6$) of all infants from the three

intervention groups. Full session videos were used for this purpose in order to give

interraters enough material to make reasonable judgements on the child's behaviour.

One interrater coded the data from four participants, the second interrater the data from

another two. Whilst interraters recognised that one group appeared to be using more

"gesture" than the other two, they were blind to the specific interventions allocated to

each group. Agreement between the researcher and the interraters was 85% for security

scores ($r = 0.85$, $n = 6$, $p = 0.03$) and 82% for dependency scores ($r = 0.82$, $n = 6$, $p = 0.045$).

The second interrater went on to code 27% ($N = 12$) of the TP 1 videos for duration of

JE: $r = 0.78$, $p = 0.003$. This correlation showed a significant agreement between the

researcher and the interrater on defining JE behaviours. The same interrater also

observed 20% ($N = 6$) of the videos for infants 18-22 months in age. These observations

were correlated for frequency of JA ($r = 0.96$, $n = 6$, $p = 0.003$); and duration of JE ($r = 0.95$, $n = 6$, $p = 0.004$). This interrater observed 23% (N=7) of the videos in the same

age range for IJA and IBR. There was significant agreement on the following codes for

IJA frequency ($r = 0.95$, $n = 7$, $p = 0.001$); and for IBR ($r = 0.88$, $n = 7$, $p = 0.009$).

Finally this interrater coded nonverbal behaviours from the 12-16 month videos inter-

rated for parental gesture: $r = 0.99$, $N = 6$, $p < 0.001$; for parental verbal imitation: $r = 0.95$, $N = 6$, $p = 0.004$; and for parental nonverbal imitation: $r = 0.99$, $N = 6$, $p < 0.001$.

5.7 Ethical considerations

To ensure child and parent participant wellbeing was protected, British Psychological Society ethical guidelines (BPS, 2008) and internal Psychology Departmental Ethics Committee protocols were followed. The study, including all participant information sheets, consent forms, and questionnaires, was approved by the internal Psychology Departmental Ethics Committee.

Materials drafted by the researcher were checked through readability software to ensure their accessibility to a range of reading abilities. For the OME study additional checks on all participant information sheets, consent forms, and questionnaires were completed by the internal Psychology Departmental Ethics Committee, as well as the NHS Research Ethics Service. Approval was given by the Fife and Forth Valley Research Ethics committee, by Greater Glasgow and Clyde Health Board and Yorkhill Hospital, as well as by the City Hospitals Sunderland NHS Foundation Trust.

Chapter 6 now outlines the linguistic assessments undertaken as part of this longitudinal investigation.

Chapter 6: The Impact of Interventions on Language and Communication Development

6.1 Introduction

Many infants appear to acquire language competence with relative ease (e.g. Goldin-Meadow, 2005), but the multi-faceted nature of the process renders analysis of key elements, timing, and the interaction of each of these a complicated task. There is no absolute agreement amongst scholars about what is involved and this has led to different theories regarding the processes and structures implicated (e.g. Tomasello, 2003). Parental scaffolding, joint attention, and gesture, along with structured routines and imitation are highlighted as facilitative mechanisms. Simultaneously, synaptogenesis in the brain occurring during the first three years appears to influence aspects of language development over the same timeframe (Bates et al., 1995; Marcus & Rabagliati, 2009). This thesis aimed to investigate the effects of teaching specific communication techniques on how language acquisition developed. In particular, there was a focus on Baby Sign, an augmentative system which claims to enhance comprehension and production by tapping into the infant's nonverbal resources and providing a vehicle to understand and express *symbolic* communication. To compare effects across the groups, vocabulary development (comprehension and production), gestural development, syntactic complexity, as well as parental verbal and nonverbal behaviours were analysed.

6.2 Why investigate Baby Sign?

Baby Sign (BS) depends on keyword gestural 'signing' to accompany speech. Gestural

research, used with older children, has shown that nonverbal communication provides a reliable indicator of when children are in the Zone of Proximal Development (ZPD), and therefore ready to move onto a more complex level of conceptual understanding. This leads to the implication that nonverbal communication can highlight a child's understanding when it is not signalled in their speech. If this is the case for older children, the question is raised whether nonverbal communication may provide enhancements to prelinguistic infants' language development as well as offering researchers a means to access that development in real time. Developmental research has already shown the importance of nonverbal behaviour, such as pointing (especially referential pointing) and joint attention, for younger children as these provide the foundation to later language and social development. Parents and children who gesture more, talk more (Rowe, 2000). However, whilst such research emphasises the importance of the intersubjective nature of language development, there is some ambiguity in interpreting the degree to which the infant has communicative *intent* when employing such tools (e.g. D'Entremont & Seamans, 2007 versus Tomasello et al., 2007). BS is promoted as a communication intervention method which might relieve some of that ambiguity.

Previous BS studies have tended to make comparisons with techniques that focused specifically on verbal labelling and different types of BS alone. This does not necessarily tap into the multi-layers of communicative intentionality (such as Grice's motivation for cooperative interaction or Searle's speech act motives (Yule, 1998)) in which language acquisition may be rooted. Consequently, it also fails to recognise that BS usage in the early years tends to occur during play and familiar routines. Thus, the

155

foundation of *play* may be the core element to any BS success rather than the infant's comprehension and use of keyword gestures/'signs' per se. If this is the case, then similar advancements might well be observable in other types of intervention, such as those involving infant-directed speech and enhanced nonverbal techniques; resulting in fewer major differences in terms of emergent vocabulary between the groups due to a common core acquisition process similar in each (typical play patterns, intersubjectivity, reciprocal attunement, and shared intentionality) and with gestural 'signs' providing no further acceleration to the infant's symbolic development beyond other techniques. This study enabled a valid comparison of the interlinked elements (gesture, verbal, and nonverbal input) by varying the emphases on each component during play. To do this, BS was compared to the intervention methods of Enhanced Verbal input (EV) and Enhanced Nonverbal input (ENV). This had not been done before.

6.3 How do infants begin to establish language?

What different levels of awareness of communicative intent do infants have at different stages of development? Do they acquire first words and phrases in the same way as nonverbal activities – elements of familiar routines? Parents do assume intent when they communicate with their baby but this does not necessarily mean the infant is actually using it – yet. Some researchers (e.g. Whiten et al., 2009) argue that symbolic intent stems from imitation, especially deferred imitation, as it is related to the infant's declarative memory ability (e.g. Jones & Herbert, 2006) and development of mental representations (Piaget, 1962; although cf. Horowitz, 2003 for an opposing view). Whilst Piaget stated that deferred imitation began around the age of 12-18 months, most

current researchers now consider infants as young as 6 and 9 months to have the rudiments of such ability (e.g. Jones & Herbert, 2006; Learmonth et al., 2004). Consequently, different intervention techniques could have different effects on this ability at an earlier age.

However, if imitation does underlie communicative intent, there is disagreement about why infants imitate at all. Imitation is multi-faced (cf. for example, Wiedermann (2003) and Meltzoff & Decety (2003)) and definitions are numerous. For example, is imitation reproducing actions due to social learning or an attempt to achieve the same goal as another person? Tomasello (2003) argued that 'true imitation' required awareness of the *original* intent when reproducing some action. If the imitator was incognisant of another person's goal in performing a particular behaviour, then any reproduced action would equal mimicry alone (e.g. Kuczaj et al., 2005). Mimicry is non-symbolic. If BS could be shown to enhance the quality of the interaction during language acquisition, even in advance of EV and ENV techniques and if there was consistency in the types of BS 'sign' an infant produced in specific contexts, this may show that BS does indeed provide more tools (for communicating), including an understanding of symbolic intent.

Thus, if advocates of BS claim that the technique goes beyond mimicry by assisting infants to develop symbolic understanding and facilitating their ability to communicate it before their speech systems mature, it is necessary to define further what is meant by 'symbolic thought'. Is symbolic ability an abstract skill acquired by the individual (that is, the *cognitive* acquisition of shared labels which we learn from others in our culture – e.g. Messer & Dockrell, 1998); or an interpersonal mechanism which suffuses our joint *actions* with others, and therefore exists dynamically and flexibly according to the

157

context and specific interactants involved (e.g. Gillespie, 2009)? Both definitions suggest the development of common ground between parent and infant, although the second definition goes beyond a cultural level to one that has uniquely interpersonal features to it. Related to this perspective is Tomasello et al.'s (2007) thesis that infants between the ages of 12-14 months can disambiguate parental requests based on the experiences they have shared with them. However, they qualify this by indicating that it is not until the end of the second year that the infant gains a better understanding of altruistic communicative intent (i.e. that someone may intend to communicate something for another's benefit and that this knowledge is shared between them). In this sense, pointing at a ball which has rolled beyond them may have a simpler, more accessible message to a younger infant, than a parent 'signing' 'ball' with/without pointing to it, unless shared intentionality is attached to both the 'sign' and the point.

By accepting Gillespie's (2009) definition, symbolism's interpersonal nature is highlighted as inherent to the interaction between parent and child rather than as an add-on to it. Moreover, it emphasises the time required to develop a perspectival stance, not only to each other but to the event or object shared. Thus, in the second definition, BS should operate like other intervention methods which enhance parent-infant interaction. Infant-directed speech, parental gestural behaviour, and BS have all been shown to enhance later vocabulary growth (e.g. Goodwyn et al., 2000; Iverson & Goldin-Meadow, 2005; Rowe et al., 2008; and Snow, 1986). Alternatively, if infants develop awareness of a symbolic/iconic intentional undercurrent within BS, as well as an awareness of person-perspectives then further advancement might be observed.

158

6.4 The purpose of the current study

The study described in this chapter was established to compare the different interventions in terms of language acquisition. The question posed was: "does BS confer the benefits onto language acquisition which are claimed?"

The aim was to investigate two key areas of language acquisition:

- Infant comprehension (phrases and words)

- Infant verbal/gestural production (including increasing complexity via MCDI)

The following hypotheses were made:

- That based on previous research all intervention groups will increase language development for comprehension in terms of comparison with the non-intervention group and accelerated developmental trajectories in advance of percentile scores

  o The BS group - as keyword signing focuses joint attention to contextualised referential labelling and thereby enhances parental scaffolding opportunities, whilst simultaneously increasing the frequency of parent-infant interaction as a whole (e.g. Acredolo & Goodwyn, 1988); that BS depends on symbolic gestures which relate predominantly to the function of objects, and thereby assists the infant by drawing from actions and embodied experiences in their physical environment (ibid, 1988, Goodwyn & Acredolo, 1993); and finally, that BS relates to findings in generic gesture research which shows that parental gesture

is connected to infant vocabulary size (cf. Chapter 4, e.g. Namy et al., 2000; Rowe et al., 2008), as well as infant gesture use (Rowe et al., 2008).

o The EV group - as IDS modifies phonological patterns and provides more reduplications (e.g. 'baby' becomes 'baba'), it simplifies syntactic structures as well as provides shorter, simpler utterances and yes/no type questions (e.g. 'B do it?'), it elongates vowel sounds and pauses (e.g. 'horsey'), and it tends to place key words at the ends of utterances so they are emphasised. It is usually more melodic, at a raised pitch and slower than adult-directed speech (e.g.'Come here dolly!') (cf. Cruttenden, 1985; Fernald et al., 1989; Gogate et al., 2000; Snow, 1986). Such devices can help to highlight word boundaries (e.g. Swingley, 2005; Thiessen et al., 2005) and phonemic statistical probabilities (e.g. Kuhl, 2004). Finally, IDS is also multimodal, including gesture (e.g. Gogate et al., 2000) which further assists word segmentation (e.g. Cunillera et al., 2010). Like BS it draws on focusing the infant's attention on a shared contextual activity/object.

o The ENV group - as the Intentionality Model proposes that the infant initiates the type of scaffolding the parent offers (i.e. the infant impels word-learning that s/he is motivated to gain by being proactive in a particular environment and thereby creating a relevant learning situation for his/her attention and goals); simultaneously s/he recognises if that environment is not optimal for the successful attainment of these goals and so strives towards bringing these two aspects to a state where such successful attainment is possible (e.g. Bloom & Tinker, 2001; Brackenbury et al., 2005). Unlike the two groups above, the infant

has a more leading role in terms of directing attention and dialogue from the offset. The ENV technique emphasised focus on the infant's facial expressions and body language, encouraging the parent to recognise and interpret the infant's nonverbal expression of their intended goals.

o All intervention groups - as the techniques encourage familiar routines and structures for play and interaction within a familiar context and with familiar key interlocutors; thus establishing quality environments for linguistic and socioemotional development. Targeted intervention should encourage parental dialogue, and parents who provide their infant with more input tend to have children with faster word recognition skills at 24 months (Hurtado et al., 2008).

• That based on previous research all intervention groups will benefit language development in terms of production

o The BS group - as it gives infants a means to use gross motor movements to express existing symbolic thought when the development of finer motor speech mechanisms have yet to emerge (e.g. Goodwyn & Acredolo, 1993). BS is considered to be a system capable of doing this as the motor system is likely to underpin both speech and gesture (e.g. Caprici & Volterra, 2008; Gentilucci & Dalla Volta, 2007; Iverson & Fagan, 2004; Roy & Arbib, 2005).

o The EV group - as the perceptual salience of words and phrases and their boundaries is enhanced in an amodal way by providing redundant cues and reference to in situ cues. Additionally the acoustic properties of IDS as

161

described above are thought to reflect physical affective actions (e.g. rocking, soothing – Fernald et al., 1989), so there is anticipated benefit to the interpersonal reciprocity between caregiver and child.

o The ENV group - as the technique should assist the infant's ability to interpret and influence adult behaviour during communicative episodes. It implies that the infant quickly develops an awareness of pragmatic intent and uses this to understand what the caregiver is trying to communicate to them, as well as to impel them towards what the infant actually intends to learn. This desire to understand others drives them to find solutions to any discrepancies between their own goals and those apparently offered by others (Bloom & Tinker, 2001; Brackenbury et al., 2005).

To investigate these hypotheses, and the prediction that none of the intervention groups would differ significantly from each other, infants (starting between the ages of 9-11 months) were allocated to one of three comparison groups to monitor changes in language and socio-emotional development over a period of 20 months. These groups used different types of intervention (BS, EV, and ENV), thereby enabling direct comparison of techniques and their effects. In addition, parental use of language during interactions was included to assess whether interventions impacted on them, too.

It was aimed to show whether the BS group showed a greater level of linguistic and socio-emotional benefit from the intervention than all other groups. As previous studies had shown that parents who gestured more, talked more, it was also aimed to discover whether there would be more parental dialogue with the infant in the BS group than in

162

all of the others. The study offered a new perspective on the comparative effects of interventions which emphasise the intersubjective and play-based nature to early language development. If it was found that linguistic benefit ensued from all of the enhanced interventions, claims for increased benefit from BS would not be supported.

6.5 The Interventions – these are described in General Methods (Chapter 5)

6.6 Methodology

Materials

Vocabulary Set

A vocabulary set based on the 'Living Language' programme (Locke, 1985) was used by all of the intervention groups (BS, EV, and ENV). The list incorporated age-appropriate vocabulary, including food, animals, people, places, toys, verbs, adjectives and colours (see Appendix 2).

Some flexibility enabled individual families to add a small number of additional words to reflect their unique circumstances (siblings, hobbies, etc.). Each intervention family received a written copy of the vocabulary in grid form (see Appendix 2). This allowed them to indicate their selection of focus words, the duration of that focus, and the order in which they had selected them. For the purposes of BS, the same words and phrases were also video-recorded. Each family in this group received a DVD (Appendix 3) of the signs in real time and a folder of photographic stills as a quick reference (Appendix 4). Both the DVD and folder were indexed to facilitate quick access to specific items (Appendix 4). The EV group received a folder with information regarding child-

directed speech (Appendix 5); and the ENV group a summarised explanation of the Intentionality Model (Appendix 6).

The table below (Table 4) represents all of the language-related measures used in the longitudinal study. Most are related to the MCDI. This is followed by a fuller description of each of the materials involved.

Table 4: All language measures used in the longitudinal study

Measure	Source material	Score	IOR
Words Understood	MCDI: Words and Gestures	Baseline:	n/a normed score
		TP1	n/a normed score
Words Produced	MCDI: Words and Gestures	Baseline:	n/a normed score
	MCDI:Words and Sentences	TP1	n/a normed score
	MCDI:Words and Sentences	TP2	n/a normed score
	MCDI:Words and Sentences	TP3	n/a normed score
Single words and total phrases	MCDI: Words and Gestures	Baseline:	n/a normed score
		TP1	n/a normed score
Total gestures	MCDI: Words and Gestures	Baseline:	n/a normed score
		TP1	n/a normed score
Single words and phrases	10 min video clips btw parent-child	One clip when infants btw 17-22 mths	CLAN software analysis
Parents' verbal output	10 min video clips btw parent-child	One clip when infants btw 17-22 mths	CLAN software analysis
Types of handshape used in infant BS signing	Video and first-person observation	n/a	IOR agreement with Deaf colleague (using BDA dictionary definitions)

The MacArthur Bates Communication Development Inventory (MCDI)

A common approach used to investigate early language acquisition is via the administration of parental report questionnaires. These are accepted as being more representative of the infant's actual capabilities and therefore lend a better level of ecological validity to the scores. One parental report has proved to be particularly popular: the MacArthur Bates Communication Development Inventory (MCDI – Fenson et al., 2007). It has a long-standing reputation for reliability and validity, having evolved from earlier questionnaires such as those of Bates et al. (1975). In addition, it has been used in previous key studies on symbolic gesturing in infants (Goodwyn & Acredolo, 1993; Goodwyn et al., 2000). It is standardized for age and gender.

The MCDI divides into two consecutive reports. The first concerns the earliest stages of language acquisition, measuring the comprehension of first words and gesture production. It is followed up by a parental report on word production and the emergence of syntax in relation to first sentences. Previously reported potential problems of biased parental reporting can be overcome by ensuring that parents are predominantly of the same SES-status. Moreover, by linking the reports with objective observations (video coding with interrater reliability), additional safeguards can be made to protect reliability.

The MCDI was used to measure emerging language at four separate time points. It consists of two levels: an MCDI for Words and Gestures; and an MCDI for Words and Sentences. The first of these engages with the infant's comprehension of words and gestures (age range 8-18 months), the second with their production of words and

165

sentences (age range 16-30 months). Focus fell on specific elements, namely Phrases Understood, Words Understood, and Total Gestures (Baseline to TP1), Words Produced and a comparison of emergent vocabulary across groups (baseline to TP3), single words versus phrase production (WP3), and complexity of sentences (M3L) both at TP3 only.

NVivo software

NVivo facilitates rich qualitative data analysis by enabling researchers to work with simultaneous tiers of data (including video, audio, and written transcripts). It allows for sources to be coded, linked and organized according to themes targeted by the researcher. In this study, digital video clips of infant-parent play were uploaded into the software for transcription, coding and analysis. (Non-digital clips were transcribed by hand, showing these via a television).

CLAN (Computerised Language Analysis) software

CLAN enables statistical analysis of language transcripts, such as the mean length of utterance (MLU), counts of the frequency of words used and counts of the combinations of words/morphemes used by specific speakers. It also allows researchers to record the context of any speech act (including nonverbal behaviours, roles, and situation). It has been particularly successful in analysing first language acquisition. It was developed by MacWhinney in 1984 as part of the CHILDES project (Child Language Data Exchange System). To analyse transcripts, researchers need to rewrite them in CLAN's CHAT mode. It is then possible to run specific analyses, such as FREQ, on each individual participant and compare the data across groups. In this way it is possible to look at specific areas of linguistic development in more depth.

Design

This study was longitudinal and of a mixed design. The between-participant factor was Group (BS, EV, ENV, or Non-intervention group) and the within-participant factor was Time-Point (Baseline, TP1, TP2, and TP3). Language acquisition change was analysed over time via a two-way ANOVA Group (4 levels) x Time-Point (4 levels)). Socio-emotional development was also analysed over time via a two-way ANOVA Group (4 levels) x Time-Point (3 levels). *GPower* was used to calculate a priori the sample size required for a repeated measures ANOVA, within-between interaction. The effect size was set at $f = 0.45$, the α error rate at 0.05, the power level at 0.95, the number of groups at 4 and the number of measurements at 4 (or 3 – see above). This resulted in a minimum recommended **total study sample** size of 20 participants required. The within-between interaction was chosen as it was initially anticipated there might be a gender difference within groups as well as a difference between the intervention and non-intervention group. The effect size was selected as most previous BS literature had not cited any effect size at all. Kirk (2009), however, found effect sizes for MCDI and gesture-related tests between 0.37-0.49, therefore any significant interactions between Group x Time-Point should have been indicated in the current tests. As attritional difficulties often arise in longitudinal studies, a slightly higher level of recruitment was targeted within feasible operationalization.

Dealing with missing data – see Chapter 5

Procedure

An initial visit was made to each of the potential participants to explain the aims of the

study, how it would be conducted, and to outline the expectations of their participation. Parents were encouraged to ask questions and to consider the study demands carefully before making a decision. This was particularly important given the length of commitment required from them. Parents were also assured that they could withdraw from the study at any point. This initial visit also provided the opportunity for the researcher to discover whether the infant had already been exposed to BS, and therefore whether participation in another group would bias the data.

The researcher visited the intervention group participants weekly for the first four weeks. This facilitated the modelling of the particular types of interaction required by the intervention method allocated, and provided parents with additional opportunities to ask questions regarding the interaction/communication method as they arose in real time. On the first visit the researcher gave each intervention family a folder containing the relevant support materials for their group: for the BS group, a folder of BS signs, and a DVD of BS signs (researcher-generated); for the EV group information about 'parentese'; and for the ENV group information and play suggestions in-keeping with the Intentionality model. All intervention groups also received a vocabulary grid and a diary (Appendix 8) in which parents provided a list of signs, words, or gestures they had seen their infant produce between researcher visits, especially at the early stages of the infant's word production. This was to get a fuller understanding of how the infants' language acquisition was developing over time, and attempted to minimise potential under-/over-reporting on the MCDIs. On the fourth visit the first video was recorded, the camera placed on a tripod to minimise distraction. Thereafter, families received a monthly visit for six months, before these visits reduced to once every six months. The average number of visits parents received was 10.63 (an average visit = 1 hour), with

168

some variation due to individual family's work commitments, illness, or holiday arrangements.

Parents in all intervention groups were asked to focus attention on *following* the infant's point of interest during play sessions rather than attempting to set the agenda themselves. This was in line with previous research (e.g. Dunham et al., 1993, and Tomasello, 1988, 1992) which showed that infant lexical acquisition was improved when an attention-following approach was adopted by the parent rather than when the infant was asked to *switch* attention to the parent's focal point of interest by default. In instances where parents did require their infant to switch attention, all were encouraged to ensure that they cultivated good eye contact, by using attention-getting words such as 'ready', 'look', 'watch', or 'again', along with speech. Attention-directing strategies assist infants when attention-switching is being used (Arbib et al., 2005, Zukow-Goldring & Arbib, 2007).

Parents were asked to spend 20 minutes a day playing with their infant. This did not require formal play, especially at the earliest stages, as routines (e.g. bathtime, bedtime, mealtimes, getting dressed) provided opportunities for play interactions. To give the experimental groups additional support, the researcher set up and managed a voluntary online parental blog which they could access and contribute to if they so wished. Parents were given the MCDI: Words and Gestures at the first visit and asked to complete it for collection at visit two. MCDIs were then administered at four monthly intervals, resulting in four time points (Baseline to TP3).

For the MCDI: Words and Gestures report, parents provided responses according to their infant's comprehension of phrases and words, and gave examples of their early gestural behaviour. The MCDI comprised a vocabulary checklist of 396 familiar words and phrases, belonging to 19 separate semantic fields (Klee & Harrison, 2001), such as action words, quantifiers, qualifiers, nouns, as well as a measure of the infant's use of gestures, imitation, and labelling. Besides indicating their infant comprehension levels, parents could also note if the infant produced the word/phrase, too. Parents in the BS group indicated whether their infant signed/said or signed + said the target words and phrases. All other groups based their responses on verbal responses only.

The MCDI for Words and Sentences superseded the Words and Gestures report at TP2 as the infants had now reached 16 months and above. It was administered again at TP3. A total of 680 words were tested now, across 22 semantic fields (Klee & Harrison, 2001). At this point responses were based on the infant's production only, omitting references to the infant's comprehension. This MCDI also introduced questions regarding the infant's burgeoning grasp of syntax, including word endings, word forms, their use of over-generalizations (such as simple plural endings, 'mouses' instead of 'mice') and production of sentences.

Both MCDIs were scored according to the infant's chronological age and gender by using the normed tables in the MCDI manual. Both versions of the MCDI were further used to analyse and compare emergent vocabulary across the groups. This involved the 19 categories of words (see Appendix 9) common to both versions of the MCDI in order to ascertain whether there were dissimilarities in terms of the types of language produced (e.g. more action words) based on the intervention method employed. All four

production time-points were included. Data were derived from each infant's actual score as a percentage of a possible total score for each category (e.g. an infant scoring 3/6 items in the connecting words section of MCDI: Words and Sentences would have a converted score of 50% entered into the analysis). Data were entered into SPSS and a multivariate ANOVA conducted with Group (4 levels) as factor.

Isolating any changes that might occur in language development between typical milestones (e.g. twelve and eighteen months) was particularly crucial given previous claims that had suggested BS might assist infants to "incorporate gestural symbols into their early vocabularies" (Acredolo & Goodwyn, 1988, p 451). The MCDI: Words and Gestures was administered over the period of 9-16 months, the MCDI: Words and Sentences: 17- 30 months. Parents initially completed the forms during the researcher's visits. They were not counterbalanced with any other assessment as different measures were not administered at the same time. As the forms became more complex and the visits less often, they were left with the parents to complete between visits, or were sent to them by surface mail.

Data for infant 'signing' were pooled from the MacArthur Bates parental reports, the videos, and parental contact. These were then divided into categories: nouns (where a feature of the object constitutes the sign, such as ELEPHANT, COW, SHEEP, PIG[7]); action nouns (where behaviour towards the noun was signified, e.g. DOLL/BABY → rocking motion, TEDDY → cuddling, CAR → turning the steering wheel); action verbs (such as EAT, DRINK, POO); social expressions (e.g. PLEASE, THANK YOU); adjectives (like HUNGRY, THIRSTY); and other (to account for infants who used

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[7] These are written as sign glosses.

question words such as WHAT, or adverbs such as AGAIN, or superlatives such as MORE, and so on). A list of 'signed' words is given in Appendix 10.

To capture play scenarios in real time, video recordings of parent-infant play were taken at the end of the first month of participation (after the first four visits). Video recordings were then scheduled for two months' later, at six months, twelve months, and eighteen months into the study. However, it was not always possible to fulfil this due to illness (infant/parent/researcher), weather conditions, and cancellations. Nevertheless, the majority of infants, who remained in the study until its completion, were recorded a minimum of five times. Video footage enabled analysis of preverbal and nonverbal behaviours, including any signs used by infants in the BS group (whether spontaneous or imitated). By so doing it was possible to measure how the infants comprehended the BS input, in terms of its communicative applicability (e.g. as a main vehicle for expressing symbolic meaning, or as support for other verbal/gestural output).

Transcripts (cf. Appendix 11) were made of a 10-minute section of videoed play at TP1 across all the intervention groups. These were used to analyse the type/token words expressed by parents in their speech with infants, and the amount of repetition occurring, as well as the infants' usage of single words and phrases. These were run through the *CLAN* (Computerized Language Analysis) software program and the FREQ (frequency) analysis chosen. To ensure the play transcripts were reliable, an interrater also transcribed 15% of the dialogues from video. As the groups were using different intervention methods, it was pertinent to investigate whether this impacted upon the type of verbal utterances the parents produced. Repetition has already been highlighted as a particular tool which Deaf parents use with their infants, and therefore it was of

interest to see if BS had influenced parents in their verbal behaviour. Data were transcribed from the video footage when infants were 17-22 months' old (at Time Point 1), and were analysed using the CLAN software program for Word Types and Tokens, investigating type/token ratios (TTR). Only 41 infants were included in this analysis (BS = 15, EV = 14, ENV = 12) as there were no video data from the Non-intervention group. In accordance with CLAN guidelines, abbreviations (such as modal verb contractions) were omitted. Gender was added into these analyses as unlike the MCDIs it had not been controlled for in the video analyses.

Results

Words and Phrases understood. From the MCDI: Words and Gestures, data were analysed for infant comprehension (words and phrases). These results are presented in Fig 2 below.

Figure 2: Mean Percentile Scores for Words and Phrases Understood from Baseline to Time-Point 1 (TP1)
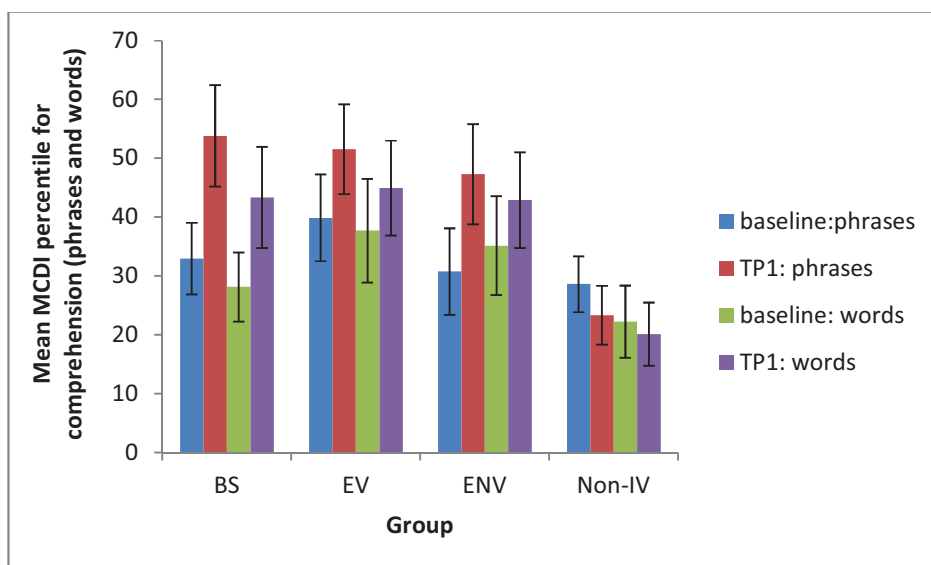
The bar chart in Figure 2 shows that all intervention groups (BS, EV, and ENV) increased in mean percentile point for phrases and words understood from Baseline to Time-point 1 (TP 1), whilst the Non-intervention group did not change. Means and standard deviations of these data are shown in Table 5 below:

Table 5: Mean percentile scores for Phrases and Words Understood across all 4 groups

Group	Mean percentile for phrases comprehended: Baseline	Mean percentile for phrases comprehended: Time-Point1	Mean percentile for words comprehended: Baseline	Mean percentile for words comprehended: Time-Point1
BS (N = 14)	32.98 (SD = 22.80; SE = 6.09)	53.85 (SD = 32.26; SE = 8.62)	28.12 (SD = 21.94; SE = 5.86)	43.36 (SD = 32.18; SE = 8.60)
EV (N = 13)	39.87 (SD = 26.69; SE = 7.40)	51.54 (SD = 27.57; SE = 7.65)	37.72 (SD = 31.80; SE = 8.82)	44.98 (SD = 29.14; SE = 8.08)
ENV (N = 11)	30.76 (SD = 24.36; SE = 7.35)	47.30 (SD = 28.21; SE = 8.51)	35.16 (SD = 28.00; SE = 8.41)	42.91 (SD = 26.55; SE = 8.13)
Non-intervention group (N = 12)	28.61 (SD = 16.48; SE = 4.76)	23.34 (SD = 17.37; SE = 5.01)	22.24 (SD = 21.24; SE = 6.13)	20.11 (SD = 18.65; SE = 5.38)

Phrases: A two-way ANOVA with a between-participant factor: Group (4 levels) and within-participant factor: Time-Point (2 levels) found that for total phrases understood, Time-Point had a significant effect: $F(1, 46) = 10.01$, $p = .003$, $\eta^2 = 0.18$, $\delta = 0.87$ with mean scores improving between baseline and TP1 (Baseline total mean = 33.23 ($SD = 22.64$, $N = 50$); TP1 total mean = 44.48 ($SD = 29.02$, $N = 50$)). There was no main effect for Group: $F(3, 46) = 1.99$, $p = .13$, $\eta^2 = 0.12$, $\delta = 0.48$ but there was a marginally significant interaction between Time-Point and Group: $F(3, 46) = 2.74$, $p = .054$, $\eta^2 = 0.15$, $\delta = 0.63$.

Planned comparisons were conducted in accordance with the hypothesis that all intervention groups would show linguistic benefits from intervention. Independent t-tests found that the Non-intervention group was significantly different to all of the intervention groups at TP1: BS and Non-intervention group $t = 3.06$, $df = 20.5$, $p = .003$, one-tailed; EV and Non-intervention group: $t = 3.03$, $df = 23$, $p = 0.003$, one-tailed; and ENV and Non-intervention group $t = 2.48$, $df = 21$, $p = 0.01$, one-tailed. Paired t-tests showed that all of the intervention groups made a statistically significant advance in total phrases understood from baseline to TP1: the BS group: $t = -2.61$, $df = 13$, $p = 0.01$, one-tailed; the EV group: $t = -1.81$, $df = 12$, $p = 0.048$, one-tailed; and the ENV group: $t = -2.21$, $df = 10$, $p = 0.026$, one-tailed. The non-intervention group was not significant: $t = 1.10$, $df = 11$, $p = 0.29$, two-tailed. Contrasts (Bonferroni) were conducted to ensure there had been no significant differences between the groups at baseline. All of these were not significant: BS and EV, $p = 1.00$; BS and ENV, $p = 1.00$; BS and Non-intervention group, $p = 1.00$; EV and ENV groups, $p = 1.00$; EV and Non-intervention group, $p = 1.00$; ENV and Non-intervention group, $p = 1.00$, showing that all changes occurred after intervention.

Words Understood: For Words Understood a two-way ANOVA with a between-participant factor: Group (4 levels) and within-participant factor: Time-Point (2 levels) found that Time-Point had a significant effect: $F(1, 47) = 4.93$, $p = .03$, $\eta^2 = 0.10$, $\delta = 0.59$ with mean scores improving between baseline and TP1 (Baseline total mean = 30.84 ($SD = 26.00$, $N = 51$), TP1 total mean = 38.20 ($SD = 28.42$, $N = 51$)). There was no significant main effect of Group: $F(3, 47) = 1.71$, $p = .18$, $\eta^2 = 0.10$, $\delta = 0.42$, or interaction between Time-point and Group: $F(3, 47) = 1.28$, $p = .29$, $\eta^2 = 0.08$, $\delta = 0.32$. Planned comparisons based on the study hypotheses as outlined above showed that all

three intervention groups were significantly different to the Non-intervention group in terms of words understood at TP1; and moreover show a similar pattern of development. The BS and Non-intervention groups: $t = 2.29$, $df = 21.32$, $p = .015$, one-tailed; the EV and Non-intervention group: $t = 2.52$, $df = 23$, $p = .01$, one-tailed; and the ENV and Non-intervention groups: $t = 2.43$, $df = 22$, $p = .012$, one-tailed. The BS group showed a significant advance in Words Understood from baseline to TP1: $t = -2.59$, $df = 13$, $p = .01$, one-tailed. None of the other groups had a significant result: The EV group was $t = -0.89$, $df = 12$, $p = .20$, one-tailed; the ENV group: $t = --1.56$, $df = 11$, $p = .08$, one-tailed; and the Non-intervention group: $t = 0.38$, $df = 11$, $p = .72$, two-tailed. Nevertheless, these scores reflect a trend in the ENV group towards single word comprehension, whilst EV results may have been masked due to an inflated baseline score. Contrasts (Bonferroni) were conducted to ensure again there had been no significant differences between the groups at baseline. All of these were not significant: BS and EV, $p = 1.00$; BS and ENV, $p = 1.00$; BS and Non-intervention group, $p = 1.00$; EV and ENV groups, $p = 1.00$; EV and Non-intervention group, $p = .87$; ENV and Non-intervention group, $p = 1.00$. **Brief Summary:** All interventions evidenced a benefit to language comprehension in terms of phrases and/or words understood as measured by the MCDI: Words and Gestures.

Gesture production: Rowe (2000) had found that infants and parents who gestured more, tended to talk more, too. Thus, it was anticipated that parents in the BS group might generally gesture more by using a manual type of intervention, and thereby increase their dialogue, too. To ascertain whether BS had had a specific effect on infant gesture output (as measured by the MCDI) these data were also analysed between baseline and TP1. Assessment measures were based on the MCDI parental scores for

first communicative gestures (such as showing, pointing, and requesting); games and routines; actions with an object (e.g. brushing teeth, eating with a spoon, sniffing flowers); pretending to be a parent (e.g. feeding, cuddling, or talking to a doll); and imitating other adult actions (e.g. typing, sweeping, digging, and so on). These findings are presented in Fig 3 below, with means and standard deviations presented in Table 6.

Figure 3: MacArthur Bates Parental Report for Mean Percentile of Total Infant Gesture from Baseline to Time point 1 (TP1)
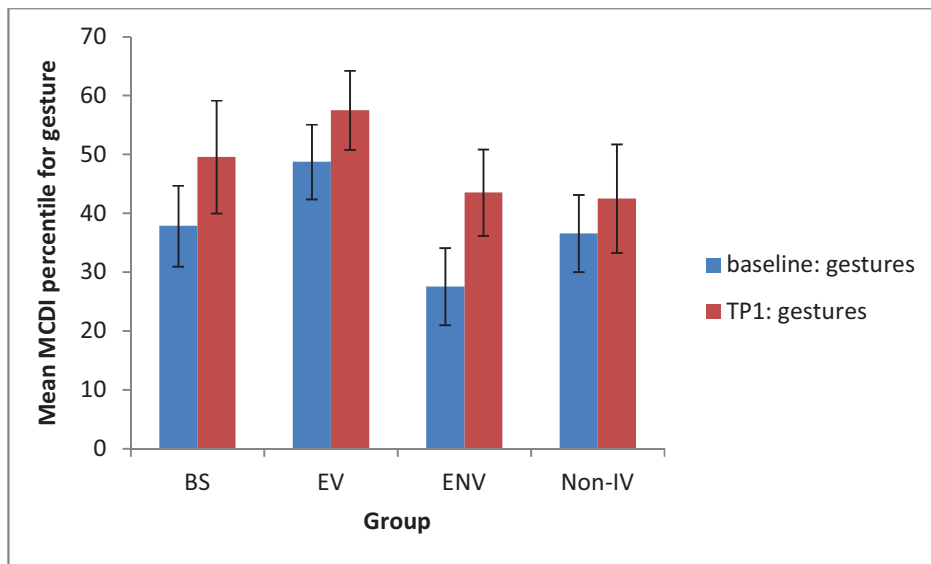
Table 6: Mean percentile score for gesture use (as measured by MCDI) across Baseline to TP1

Group	Mean percentile for gesture use: Baseline	Mean percentile for gesture use: Time-Point1
BS ($N = 14$)	37.87 ($SD = 25.78$; $SE = 6.89$)	49.61 ($SD = 35.88$; $SE = 9.59$)
EV ($N = 13$)	48.77 ($SD = 22.96$; $SE = 6.37$)	57.55 ($SD = 24.31$; $SE = 6.74$)
ENV ($N = 11$)	27.58 ($SD = 21.79$; $SE = 6.57$)	43.54 ($SD = 24.32$; $SE = 7.33$)
Non-intervention group ($N = 12$)	36.60 ($SD = 22.64$; $SE = 6.54$)	42.54 ($SD = 32.00$; $SE = 9.24$)

For mean total infant gestures measured by the MCDI, there were noted increases for all the groups from baseline to TP1. A two-way ANOVA with between-participant factor: Group (4 levels) and within-participant factor: Time-Point (2 levels) for gesture output showed a significant effect for Time-Point: $F(1, 46) = 7.68$, $p = 0.008$, $\eta^2 = 0.14$, $\delta = 0.77$ with mean number of gestures increasing from baseline to TP1 (Baseline total mean = 38.13 ($SD = 23.94$, $N = 50$), TP1 total mean = 48.64 ($SD = 29.55$, $N = 50$)). There was no main effect of Group: $F(3, 46) = 1.29$, $p = 0.29$, $\eta^2 = 0.08$, $\delta = 0.32$. There was no significant interaction between Time-Point and Group: $F(3, 46) = 0.29$, $p = 0.83$, $\eta^2 = 0.02$, $\delta = 0.10$, therefore it appeared that BS had had no enhancing effect in gesture use overall when compared to the other groups. In accordance with the hypotheses, paired t-tests, using data from baseline to TP1, showed that Time-Point differences were due to significant increases in gestural use for the ENV group: $t = -2.25$, $df = 10$, $p = 0.02$, one-tailed. The BS group was just outside of significance: $t = -1.69$, $df = 13$, $p = 0.055$, one-tailed. Neither of the other groups showed any significant advances between baseline and TP1 (the EV group: $t = -1.07$, $df = 12$, $p = .16$, one-tailed; and the Non-intervention group: $t = -0.73$, $df = 11$, $p = 0.48$, two-tailed). Contrasts (Bonferroni) were conducted to ensure there had been no significant differences between the groups at baseline. All of these were not significant: BS and EV, $p = 1.00$; BS and ENV, $p = 1.00$; BS and Non-intervention group, $p = 1.00$; EV and ENV groups, $p = .30$; EV and Non-intervention group, $p = 1.00$; ENV and Non-intervention group, $p = 1.00$. **Brief summary:** The hypothesis that BS assists gestural production was marginally supported but it was the ENV group which accelerated most in this medium. This is particularly salient when comparing the EV and ENV groups at baseline. Age factors were not relevant. Thus, gesture may be enhanced by focusing on nonverbal behaviour during interaction and play rather than giving formal instruction of 'signs' per se.

Language Production: Having analysed the comprehension and gesture data, attention turned to comparison of infant word production rates across the groups. Previous research on BS has claimed that the technique accelerates infants' expressive skills. Other literature has linked infant-directed speech (IDS), as well as gesture use to verbal production. This suggests that there should be clear differences between the intervention groups and the non-intervention group. Moreover, if BS enhances production beyond IDS and general preverbal gesturing, this should be evident in the results. Production data from both MCDIs: the Words and Gestures, and the Words and Sentences forms were analysed. This meant that there were four Time-Points available instead of two (as was the case for the comprehension data above). These findings are presented in Fig 4 below with means and standard deviations presented in Table 7.

Figure 4 MacArthur Bates Parental Report for Mean Percentile of Words produced
    (Baseline to TP3)
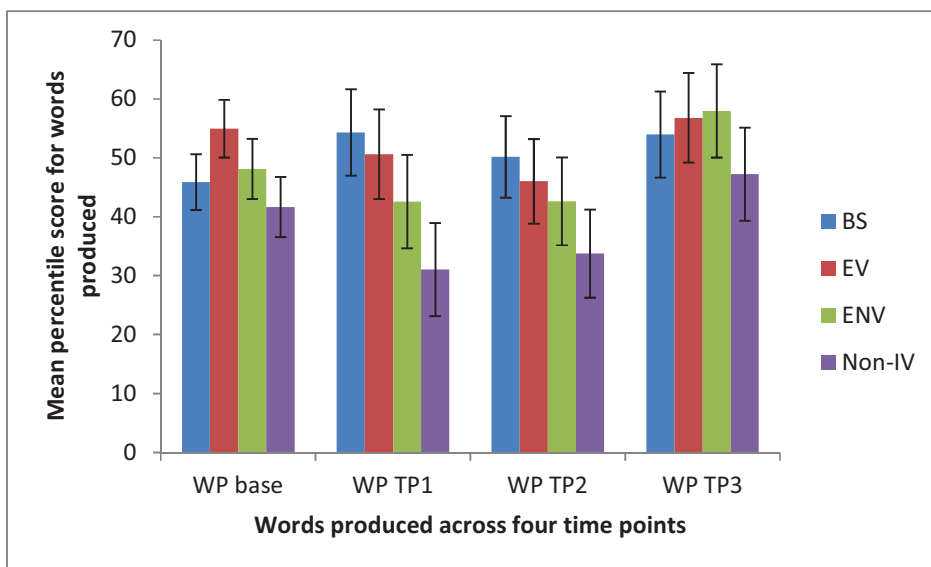
Table 7: Percentile mean scores for words produced: baseline to TP3

Group	Mean percentile for words produced: Baseline	Mean percentile for words produced: Time-Point 1	Mean percentile for words produced: Time-point 2	Mean percentile for words produced: Time-point 3
BS	45.89 (SD = 14.60)	54.33 (SD = 33.82)	50.19 (SD = 31.83)	53.98 (SD = 32.91)
EV	54.98 (SD = 18.33)	50.64 (SD = 27.02)	46.03 (SD = 25.49)	56.83 (SD = 28.44)
ENV	48.13(SD = 20.15)	42.61 (SD = 23.72)	42.64 (SD = 23.09)	57.98 (SD = 23.19)
Non-intervention group	41.67 (SD = 17.75)	31.06 (SD = 22.50)	33.76 (SD = 20.68)	47.24 (SD = 22.56)

Responses from the MCDIs were compared to the standardized norms provided in the MacArthur Bates' manual. A two-way ANOVA with between-participants factor of Group (4 levels) and within-participant factor of Time-Point (4 levels) found a significant difference for Time-point: $F(2.26, 106.38) = 4.03$, $p = 0.02$, $\eta^2 = 0.08$, $\delta = 0.75$ (Baseline total mean = 47.74 (SD = 17.83, N = 51), TP1 total mean = 45.16 (SD = 28.08, N = 51), TP2 total mean = 43.49 (SD = 25.84, N = 51), and TP3 total mean = 54.06 (SD = 26.89, N = 51)). There was no significant effect of Group: $F(3, 47) = 1.19$, $p = 0.32$, $\eta^2 = 0.07$, $\delta = 0.30$. There was no significant interaction between Time-Point and Group: $F(6.79, 106.38) = 0.81$, $p = 0.58$, $\eta^2 = 0.05$, $\delta = 0.33$. Post hoc Bonferroni comparisons for time-point showed that the significant differences occurred between TP1 and TP3 ($p = .03$), as well as TP2 and TP3 ($p < .001$). As the hypotheses anticipated potential differences between all the intervention groups and the non-intervention group, planned comparisons were undertaken at each time-point. These results showed that there was a significant difference between the BS and Non-intervention group at TP1 for words produced: $t = 2.03$, $df = 24$, $p = .03$, one-tailed.

There were no other significant differences recorded. All of these results are shown in Table 8 below.

Table 8: Planned Comparisons for Mean Words Produced across Time-Points and Groups

Groups/Time-Point	TP1	TP2	TP3
BS-EV	$t = .31$, $df = 25$, $p = .38$, one-tailed	$t = .37$, $df = 25$, $p = .36$, one-tailed	$t = -.24$, $df = 25$, $p = .41$, one-tailed
BS-ENV	$t = 1.01$, $df = 24$, $p = .16$, one-tailed	$t = .68$, $df = 24$, $p =.25$, one-tailed	$t = -.36$, $df = 23.22$, $p = 0.36$, one-tailed
BS- Non-intervention group	$t = 2.03$, $df = 24$, $p = .03$, one-tailed	$t = 1.53$, $df = 24$, $p = .07$, one-tailed	$t = .62$, $df = 22.99$, $p = .27$, one-tailed
EV-ENV	$t = .79$, $df = 23$, $p = .22$, one-tailed	$t = .35$, $df = 23$, $p = .37$,one-tailed	$t = -.11$, $df = 23$, $p = .46$, one-tailed
EV- Non-intervention group	$t = 1.96$, $df = 23$, $p =.03$, one-tailed	$t = 1.32$, $df = 23$, $p = .10$, one-tailed	$t = .93$, $df = 23$, $p =.18$, one-tailed
ENV- Non-intervention group	$t = 1.22$, $df = 22$, $p = .12$, one-tailed	$t = .99$, $df = 22$, $p = .17$, one-tailed	$t = 1.15$, $df = 22$, $p = .13$, one-tailed

Both Figure 4 and Table 8 suggest that all of the groups were performing at similar levels in terms of word production.

The Words and Sentences parental report offered a further opportunity to analyse the mean percentile scores for infants' longest utterances and syntactic complexity at TP3. This was the only time-point to produce sufficient data for analysis, and enabled comparison beyond production of single words. These results are shown in Fig 5 below.

Figure 5: Comparison of Mean Percentile for Three Longest Utterances and Syntactic Complexity as measured by the MCDI: Words and Sentences parental report (TP3)
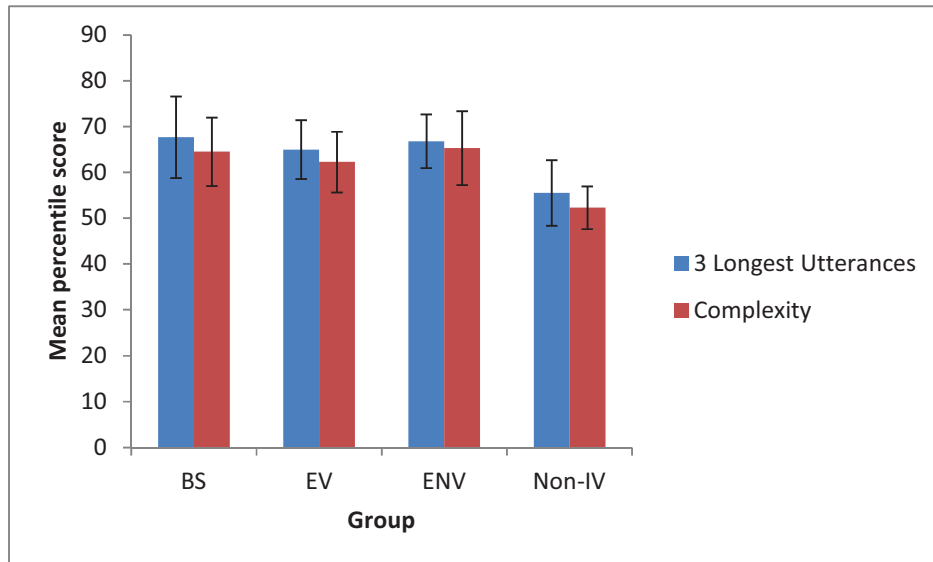
Clearly all groups have a similar level of output and complexity. Thus, one-way ANOVAs showed no significant main effect of Group for longest utterance: $F(3, 46) = 0.54$, $p = 0.66$, $\eta^2 = 0.03$, $\delta = 0.14$ (TP3 total mean = 62.78, $SD = 23.79$, $N = 50$); or for syntactic complexity: $F(3, 47) = 0.65$, $p = 0.59$, $\eta^2 = 0.04$, $\delta = 0.19$ (TP3 total mean = 60.72, $SD = 24.03$, $N = 51$). A cross-check of *in vivo* output uttered by infants in the **videos** when they were between 17-22 months supports this similarity across the intervention groups. The mean point scores are shown in Figure 6 below.

Figure 6: Intervention Group comparisons for mean point score for single words and phrases used by 17-22 month olds as measured from a 10-minute video clip at the start of play session
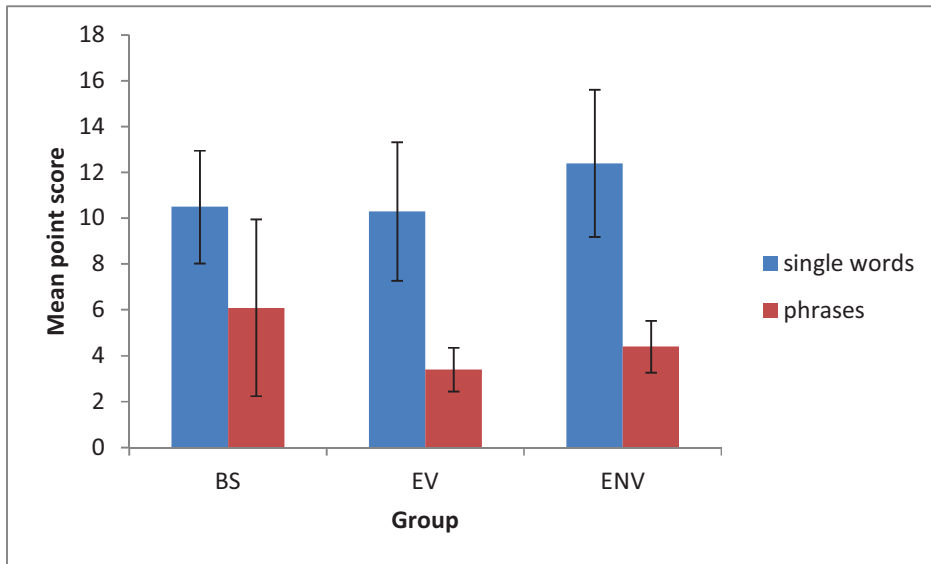
Figure 6 shows that the mean number of words and phrases used by infants across the three intervention groups was similar across this age range as recorded within the 10 minute clip. Standard error bars show there was a wider difference amongst individuals within the BS group for phrases produced than the other two intervention groups. As the MCDI had norms for age and gender, these were entered as covariates to control for any specific effects in the above analyses. A one-way ANOVA showed no significant main effect for Group in terms of single word $F(4, 25) = 0.85$, $p = 0.51$, $\eta^2 = 0.12$, $\delta = 0.23$ (Total mean = 11.07, $SD = 8.95$, $N = 30$); or for phrase production: $F(4, 25) = 0.56$, $p = 0.69$, $\eta^2 = 0.08$, $\delta = 0.16$ (Total mean = 4.63, $SD = 7.37$, $N = 30$). **Brief Summary:** None of the interventions showed a long-term advantage for word production therefore this hypothesis was not supported.

With no differences in the mean *quantity* of language production, including syntax between groups, the type of language produced was now investigated. This was to ascertain whether there were dissimilarities in terms of the types of language produced (e.g. more action words) based on the intervention method employed. To measure this, scores were tallied from each of the vocabulary sections within the MCDI and converted to percentages of the possible totals per section. This resulted in scores for 19 vocabulary types over three time-points (19 x 3). Baseline was not included to ascertain changes after it. A two-way ANOVA with between-participant factor: Group (4 levels) and within-participant factor: Time-Point (3 levels) over TP1 to TP3 showed no main effect of type of vocabulary emerging across the groups. As there were 19 categories (per each of the four time-points) the majority of these are not reported here (see Appendix 9). To ascertain whether any of the interventions had engendered comprehension of particular concepts, age was added as a covariable. Age (not Group) effects emerged for the categories of time: $F(1, 27) = 11.38$, $p = 0.002$, $\eta^2 = 0.30$, $\delta = 0.90$., question words: $F(1, 27) = 8.45$, $p = 0.007$, $\eta^2 = 0.24$, $\delta = 0.80$, and pronouns: $F(1, 27) = 7.53$, $p = 0.01$, $\eta^2 = 0.22$, $\delta = 0.75$. This is unsurprising as these concepts are developed at a later cognitive level. **Brief summary**: the type of intervention did not impact on the emergence of vocabulary across the groups.

'Sign' Vocabulary in BS Group

As there was a particular focus on the BS group, it was of interest to investigate the types of 'signed'[8] words the infants were producing. Data were pooled from the

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[8] Words that appeared to imitate BS 'signs' used by parents, or were recognised as consistent representations of specific objects/events within the family.

MacArthur Bates parental reports, the videos, and parental contact (see Appendix 10).

Figures 7 and 8 show the frequency of each type of category used by each participant.

Figure 7: Number of nouns, action nouns and actions signed by infants in the BS group
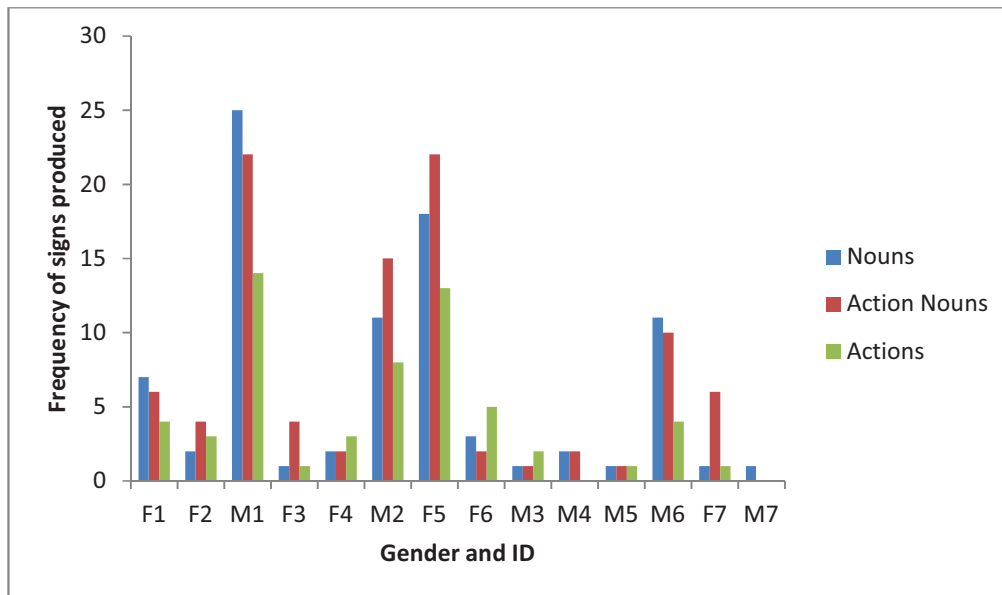
Figure 7 shows that of the four greater producers of 'sign' for these categories, three were male and one female. All of these 'signed' a higher percentage of nouns and action nouns than other types of language. They produced both spontaneous (but previously taught) as well as imitated 'signs'. 'Signs' most likely to be initiated across the group were those for DOLL/BABY, PIGGY, FLASH, AGAIN, GO (as in 'ready, steady, go'), DOG, BED/SLEEP, ALL GONE, and BYE-BYE. Clearly some of these are used in songs and nursery rhymes, as well as in non-BS participant gesturing. PIGGY and AGAIN stand out as exceptions, as these were used in regular play routines during the study, and the latter may have been confused with GO mentioned above. Some of the infants in this group did not produce 'sign', choosing instead to point whilst vocalising. This was particularly the case when referring to events/objects which were not present

at the time of discourse. Common handshapes used were those found also in non-signing children (i.e. from the 'B', 'C', '5', and 'O' notation groups).

As Pizer et al. (2007) had mentioned the desire of parents using BS to 'encourage socially appropriate behaviour' (2007, p389), the amount of social expressions was also measured. This is shown in Figure 8 below, along with other types of production (adjectival, question formats, adverbs, and superlatives).

Figure 8: Number of social expressions, adjectives and other signed by infants in the BS group
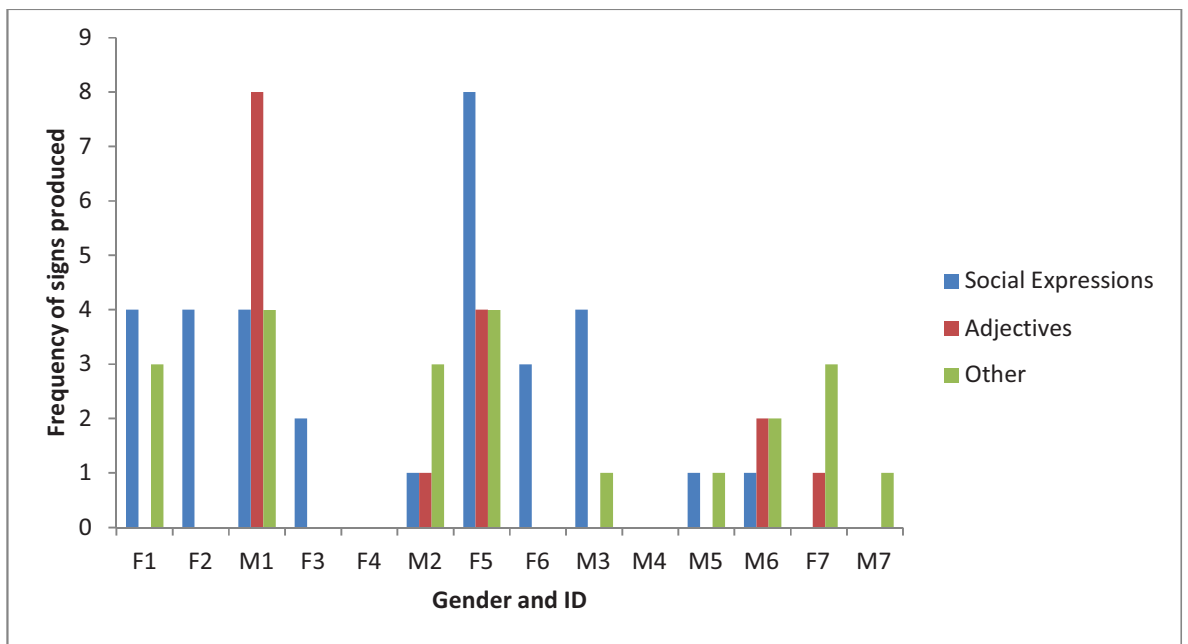
Figure 8 shows that only five of the fourteen infants produced at least one adjective in 'sign', with only three producing two or more. Male 1 (M1) was by far the greatest producer of adjectives, often using them to give commentary to activities/events. As seen in Figure 7, he was also the most prolific producer of 'sign' overall. Most of the infants used at least one 'sign' from the social expressions' category, with Female 5

(F5) producing double the amount of any other. Nine of the fourteen used a 'sign' to signify other linguistic categories. This was mainly to express MORE, AGAIN, or ALL GONE. Like Figure 8 above, the last of these also appears in the natural gestures of non-BS participants. Two participants used a question 'sign': (M2) for WHAT; and F1 for WHERE.

Due to the smallness of this group ($N = 14$) and the fact that many infants within it did not produce 'signs' at all, it was not possible to conduct statistical analyses on the data. However, Table 9 shows the means for each type of 'sign', along with the medians and modes.

Table 9: Number of 'signed' words produced by infants in BS group

Nouns (e.g. BALL, DADDY, PIG)	$M = 5.93$ (median = 2, mode = 1, range = 1-25)
Action nouns (e.g. CAR, BANANA, DUCK)	$M = 6.5$ (median = 2, mode = 1, range = 0-22)
Actions (e.g. FLASH, BRUSHING TEETH, WAIT)	$M = 4.21$ (median = 3, mode = 1, range = 0-14)
Social expressions (e.g. PLEASE, THANK YOU, HI)	$M = 2.21$ (median = 1.5, mode = 0, range = 0-8)
Pointing (specifically in 'signed' sense: ME, YOU, etc.)	$M = 0.43$ (median = 0, mode = 0, range = 0-4)
Adjectives (e.g. HUNGRY, THIRSTY, SLEEPY)	$M = 1.21$ (median = 0, mode = 0, range = 0-8
Other (e.g. MORE, AGAIN, WHERE)	$M = 1.43$ (median = 1, mode = 0, range = 0-4)

Brief summary: There was much individual difference within the BS group in terms of infant 'sign' production, suggesting that it did not benefit all. Very few infants created their own 'signs' for an object, or referred to a displaced event/object through 'sign'. Invented 'signs' contained an element of relevant action to describe the object from the

infant's perspective. For example, one infant 'signing' 'spoon' flicked his thumb out from behind his front teeth (an action he completed when licking the back of a spoon during mealtimes); another symbolised 'dog' by sticking his tongue out and panting. However, the majority of infants used 'signs' in situ and in imitation. Symbolic awareness was less evident than the desire to maintain the interaction.This hypothesis was, therefore, not supported.

Parental Language

Attention now turned away from infant comprehension and production towards parental usage during interactions. As the groups were using different intervention methods, it was pertinent to investigate whether this impacted upon the type of verbal utterances the parents produced. Repetition has already been highlighted as a particular tool which **Deaf** parents use with their infants, and therefore it was of interest to see if BS had influenced parents in their verbal behaviour. Data were transcribed from the video footage when infants were 17-22 months' old (at Time-Point 1), and were analysed using the CLAN software program for Word Types and Tokens, investigating type/token ratios (TTR). An interrater also transcribed 15% of the dialogues from video. Where there were discrepancies between the researcher and interrater attempts were made to reach consensus. This led to 98.24% reliability.

The parental speech of 41 infants was included in this analysis (BS = 15, EV = 14, ENV = 12). There were no data from the Non-intervention group as these participated on the basis of paper assessments only. In accordance with CLAN guidelines, abbreviations

(such as modal verb contractions) were omitted. The mean types and token scores per group are shown in Figure 9 and Table 10 below.

Figure 9: Parental spoken output – means of types and tokens (different types of words and overall number of words used)
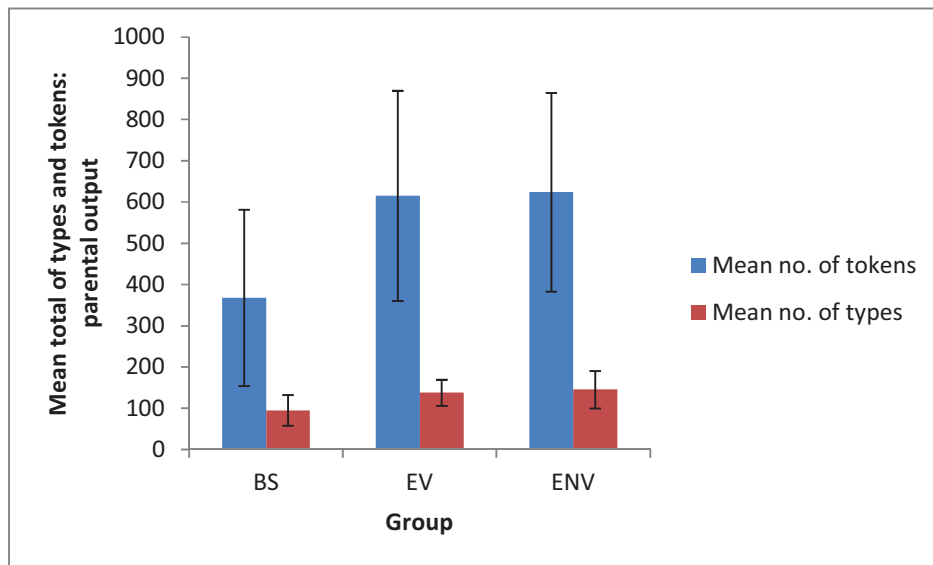
Table 10: Mean Types and Tokens of Words Used by Parents in Each Intervention Group

Group	Mean Total No. of Different Words Used (Types)	Mean Total No. of Words (Tokens)
BS (*N* = 15)	95.27 (range 35 – 173)	367.60 (range 61 – 761)
EV (*N* = 14)	137.79 (range 94 – 201)	615 (range 286 – 1292)
ENV (*N* = 12)	145.25 (range 87 – 227)	624.08 (range 246 – 1089)
Total (*N* = 41)	124.41	527.15

The above table suggests that parents in the BS group were more likely to reduce their verbal output overall and employ less variety in the types of words chosen. A One-way ANOVA, found a significant main effect of Group for total words used (tokens): $F (2, 38) = 5.40$, $p = 0.009$, $\eta^2 = 0.22$; and for number of different words used (types): $F (2, 38) = 7.09$, $p = 0.002$, $\eta^2 = 0.37$. Bonferroni pairwise comparisons suggested that the BS group was significantly lower than the EV and the ENV groups in terms of output for both overall tokens and types: BS with EV(for types: $p = .01$; and for tokens: $p = .02$); BS with ENV(for types: $p = .004$; and for tokens: $p = .02$). To check whether the BS group used a higher number of repetitions, analysis was made of repeated parental utterances to total utterances, controlling for the overall amount of parental spoken output to ensure there were no skews within the comparisons. These data can be found in Figure 10.

Figure 10: Ratio of mean parental repeated to total utterances (from a 10-minute video clip)
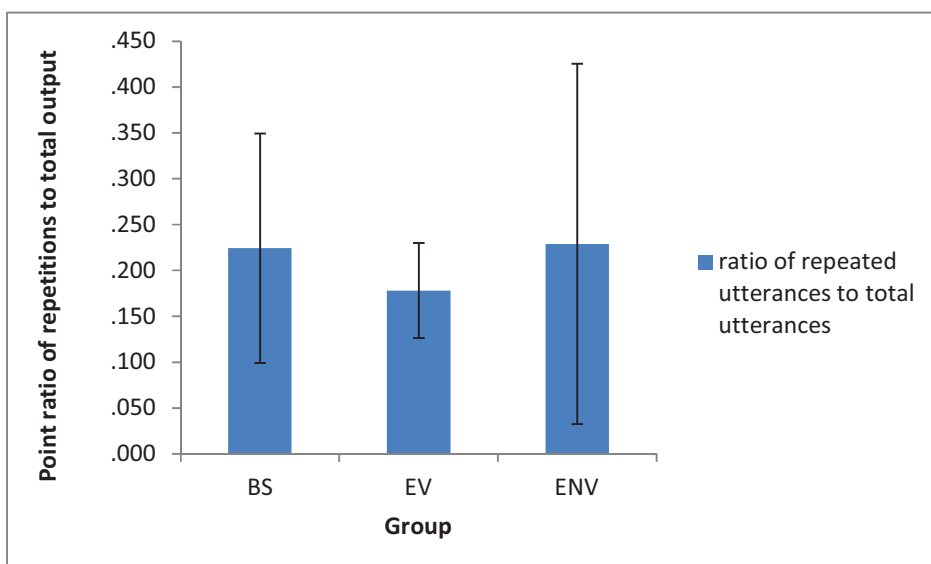
A One-way ANOVA found that there was no significant mean difference between groups for repetition: F (2, 38) = 0.61, p = 0.55, η^2 = 0.03. This suggests that the BS group were not using more verbal repetition but may have been using more repeated signs. **Brief summary**: parents in the BS group did not use more verbal repetition than the other groups but they did use less verbal language overall. This was unexpected.

6.7 Discussion

Hypothesis 1 predicted that, based on previous research, language comprehension benefits would be seen in all intervention groups. The MCDI enabled measurement of this variable between baseline and TP1 only. BS, EV and ENV groups all showed improvements in percentile score for comprehension of phrases. The BS group evidenced additional improvements in mean percentile scores for single words. These results therefore supported the hypothesis.

Why might targeted intervention work? The role of JA and structured familiar routines

Possible mechanisms underpinning these findings for phrase comprehension were worth exploring[9]. Firstly, parents in all three intervention groups were instructed to pay attention to the importance of joint attention-building, so talked predominantly about objects/events in context only when they and their infant were engaged in the same activity. Carpenter et al. (1998) had highlighted the importance of following the infant's attention and engaging in conversation within the joint attentional frame. Secondly, familiarity of the toys and games established patterns of structured and predictable

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[9] Note the significant result in terms of family history of SLI for the EV group has not translated into lower MCDI scores for this group when compared with the others after baseline.

routines and dialogue. These factors are known to have a positive effect on language development (e.g. Bruner, 1983; Tomasello, 2003), especially as they facilitate appropriate scaffolding. BS, albeit a keyword supplementation, emphasised the combination of spoken language, objects/events, and the 'sign' together. The EV technique cued the infant to target areas within the vocal stream, especially at the ends-of-utterances and thus facilitated turn-taking (e.g. Snow, 1986). The ENV intervention focused on the infant's nonverbal affective and communicative behaviours, and therefore targeted parental attention on the infant's goals within the interaction.

The role of the multimodal redundancy hypothesis

As all three intervention groups were using some form of nonverbal gesture along with spoken dialogue, infants were often presented with multimodal information, permitting the overlap of redundant cues. Bahrick and Lickliter (2000 & 2004) showed that infants benefit from multisensory cues, not only in terms of rhythm and tempo perception, but also for selective attention. Basing their rationale on Gibson's theory of perception, they hypothesised that infants use overlapping, amodal sensory information to gradually construct a unitary representation of an object or event (Bahrick et al., 2004). Gogate et al. (2001) have also shown that temporal synchrony is useful. Interactions for the intervention groups in this thesis study were established on frequent and structured play or routines, such as getting dressed or bathtime, thereby exposing the infant to cumulative cues, promoting their detection and assisting in the attribution of meaning to them over time. However, as the infant's dependence on multimodal cues reduces gradually, this may explain the waning linguistic influence, particularly of BS and IDS over all the time-points (Bahrick & Lickliter, 2004; Soderstrom, 2007). An eye-tracking

study of infants using BS could establish the locus of attention for infants when 'signs' are presented. If the focus constantly shifts, the possibility that the infant is specifically encoding the 'sign' as opposed to attending to the action as part of a holistic system of cues becomes less likely.

The role of affordances and perceptual salience

Gibson's perception theory has also informed other studies. Zukow-Goldring and Arbib (2007) have suggested that infants use affordances in perceiving and storing memory traces of aspects experienced within their environment, whilst Pruden et al. (2006) have found that perceptual salience assists infants in word learning. It is conceivable that the principle of affordance has a similar foundation to that of perceptual salience and that these mechanisms may provide an explanation for the finding that the BS group appeared to have a slight temporary advantage in comprehending single words. Looking more closely at the types of words BS infants' retained in this study, could illuminate whether such factors might influence the 'signs' generally found in the infant repertoire.

In the BS group 'signs' for 'sheep', 'cow', 'pig', 'duck' and 'elephant' were commonly recognised. Although these were often confused with those 'signed' in the same place (thereby discounting one-to-one correspondence), it is possible that infants cross-mapped concrete generic features of particular toys in situ with the simultaneous 'sign' given, and thereby anchored them by situating them in the relevant space. Such an interpretation would link to the findings of Wilbourn and Casasola (2007 – cf. §4.6, p 112) who exposed typically-developing hearing children between the ages of 6-10 months, and with no previous experience of ASL, to ASL-based signs. They found that

193

the infants perceived alterations in facial expression and location but did not show awareness of handshape or movement. The findings could indicate storage of memory threads based on spatial relations (cf. Cohen and Brunt, §4.5, p 108), something which is not detected when interpreting infant comprehension from their production (and supports Bahrick's 2004 contention that the infant gradually moves towards representation of a holistic entity). These behaviours would go beyond typical behaviours exhibited by most infants of situating certain words in space (e.g. 'man' resulting in a gaze towards the window (relating word to 'postman'); and permits the anchoring of features to relevant locations (especially the head, nose, mouth, feet which are significant factors in embodied cognition and of which infants are becoming increasingly communicatively aware).

Additionally, the 'signs' for 'duck', 'go', 'baby' relate to readily observable actions. This may again facilitate attention to perceptually salient features of events in the environment (including the use of 'go' or 'again' for causative effect). Just as Nelson and Clark suggested that initial word learning may depend on shape or function, and Werner and Kaplan prosthelytized that infants create symbols from their sensori-motoric schemes and 'actions on the world', it is conceivable that BS facilitates the utilisation of specific salient features to represent objects/events in the infant's own mind (but not yet as communicable representations which the infant recognises they can share). This is more akin to recognition than communication per se.

Simultaneously, whilst the BS group may benefit from visual perceptual salience, the EV technique should provide a similar and additional benefit acoustically. EV puts an emphasis on positive vocal affect (e.g. Reissland et al., 2003; Singh et al., 2002), on

melodic prosody (Snow, 1986), and on reciprocal sensitivity (Smith & Trainor, 2008) which maintains the infant's attention and enjoyment. These elements can be adapted according to the age and sex of the child (Kitamura et al., 2002), as well as for multiple-birth siblings (Niwano & Sugai, 2003). Although this technique highlights targeted words, the EV group was not found to match the BS group on single word comprehension. Again the multimodal redundancy hypothesis may provide an answer to this. Houston-Price et al. (2006) found that infants are assisted by different cues at different points of development. At 13 months it appears that infants only learn object labels if the parent is looking at the object whilst simultaneously handling it and naming it. The multimodality of the parent in the BS or ENV group might be more obvious when doing this ('signing' and pointing slow down the act) than the parent in the EV group who might glance at an object before looking back to the infant, so the gaze aspect becomes clipped. A study investigating the timing of multimodal cues might illuminate any differences.

The role of affect in communication

Other factors also play a role. A key element in communication unmentioned so far is that of affect. Singh et al. (2002) found that infants prefer positive affective talk over IDS, Soderstrom (2007) noted that parents using tonal languages (e.g. Chinese) subsume tonal regulations if they are in conflict with those for expressing positive affect. Research involving depressed mothers has shown the impact of intonation on infant interactions (e.g. Reissland et al., 2003); and Erting et al. (1994) evidenced Deaf parents using more positive affect facial expressions with their infant in the first 6

months. The question here is whether hearing parents can exhibit positive affect as clearly when using BS, if it seems difficult or counter-intuitive to them.

Parents in the EV group used positive affect in their vocal output. For the ENV group there was also a partial focus on affect by targeting the infant's nonverbal behaviour and centring the dialogue on it. This should have encouraged parents to become sensitive to both their infant's affective state and communicative intentions during interactions, and resulted in relevant responses to the behaviour exhibited. Previous literature indicates that communication focused on the infant's perspective (e.g. desire language – Taumoepeau & Ruffman, 2006; imitation and early symbolic gesturing – Kuczaj et al., 2005) resonates more with the infant him/herself. Thus, this type of intervention should encourage good reciprocal sensitivity. In sum, it is possible that the outcomes from each of the interventions are similar, even though the mechanisms underlying them are subtly different. A study of visual perceptual salience across different groups could establish whether there is a particular temporary advantage to infants using BS for single words. The fact that BS infants are quickly matched by other types of intervention, however, implies that all infants begin to link information from cues to create a holistic representation.

The role of gesture

Even so, it is notable that ENV infants showed the greatest accelerated gesture production between baseline and TP1, with the BS group just beyond a significant effect. Both focused on interpreting communicative nonverbal behaviours: BS encouraging gesture for labelling and therefore its use by **both** parent and child was

196

important from a cognitive and symbolic perspective; the ENV group establishing any specific effect of parental focus on the *infant's* nonverbal behaviours. ENV parents were encouraged to observe and follow their infant's eye gaze, to observe facial and body cues, and to attempt to follow and express their child's intent verbally when interacting. Whilst doing so they gave short, simple narratives to the infant's engagement in the activity. Such a focus on nonverbal elements may have particularly impacted on ENV parents' awareness of their own level of general nonverbal behaviour. Unfortunately, these data were not available from the current study as measurement of parental behaviour did not occur at baseline. As Rowe et al. (2008) have found that infant gesturing is influenced by parental gesturing (see § 4.3, p 103) there may have been a particular influence on the ENV group. A study measuring parental gestural behaviour pre-, during and after intervention is required to measure whether their nonverbal behaviours do change. Equally, a study investigating how infants use nonverbal skills longitudinally would also be informative. Does ENV maintain a sustained improvement in nonverbal development and if so, how might infants then use such information? Do infants become more attentive to affective components within the communicative interaction, thereby becoming more mindful of the affective content of communication? Further exploration is warranted.

A comparison of gesture and BS

It was of note that some infants in the BS group preferred to use a point and vocalisation rather than use a 'sign' which they had been taught. A preference to point links to previous research on imperative and declarative pointing (Bates et al., 1975). Infants learning about intent begin to use points according to different goals. Tomasello et al.

(2007) stated that infants might use pointing for informing, requesting, commenting or sharing affect. Thus, pointing offers a vehicle into contextualised mutual understanding of own and other minds, own and other intents. This is a necessary foundation communicative skill. Infants preferring this to BS may have been exhibiting wider communicative needs.

Most infants using any 'signs' themselves did so in situ and immediately after the parent. This may suggest the lack of a symbolic tier to their 'signed' communication, and rather an associative/imitative use to maintain the interaction. Infants who created new 'signs' used sensori-motoric experiences to formulate action sequences (again in situ) which were then recognised by their parents to represent specific items (cf. p 165 re 'spoon', 'dog'). This reflects Acredolo & Goodwyn's (1985) observation that infants' first use of BS tends to be indexical. The use of BS across the group for social expressions, such as 'please' or 'thank you' resonates with a socio-emotional foundation for the infant: an attempt to receive parental praise, and/or imitate the parent's behaviour to bond reciprocally; as well as a socialization goal for the parents (Pizer et al., 2007). Ultimately all intervention techniques aimed to help nurture reciprocal sensitivity: BS and ENV in a semi-nonverbal manner, the EV group acoustically. Scholars, such as Marvin and Britner (2008), Stern (2000), and Trevarthen (1980) have emphasised the importance of intersubjectivity, selective attunement and reciprocal sensitivity to the infant's socio-emotional development and thereby other types of development, including language and cognition. These issues are dealt with separately in Chapter 7.

A synthesis of gesture and speech

In sum, gesture and speech appear to have a symbiotic relationship. Research tends to support the theory of a single speech-motor system (Butcher & Goldin-Meadow, 2000; Capirci et al., 1996; Iverson & Fagan, 2004; McNeill, 1985; and Roy & Arbib, 2005). Speech and motor developments seem to be synchronous (e.g. Gentile, 1978); and certainly gesture produced at the same time as speech appears to relate to the same planning processes and control system (e.g. Gentilucci & Dalla Volta, 2007; Iverson & Fagan, 2004). Thus, it is the *combination* of speech and gesture where noticeable benefits occur (e.g. Cunillera et al., 2010; Gogate et al., 2000). These benefits continue across the lifespan (e.g. in noisy environments, communicating with non-native language skills). McNeil et al. (2000) found that older children (mean age 51 months) relied upon appropriate gestures with speech to understand especially more complex utterances but that this reliance decreased as their verbal skills became more competent.

Gentilucci and Dalla Volta (2007) assert that Broca's area is specifically implicated in the transformation of gestures into spoken word forms. Gogate et al. (2000) showed that temporal synchrony between gestures and verbal labels help infants learn the links between syllable-object pairs. Such findings imply a cognitive underpinning to process change. Infants who have an ability to perceive patterns and to engage in statistical strategies (thereby giving them the skills to isolate permitted phonetic strings and boundaries) become more adept at deciphering speech with exposure to meaningful, patterned social interaction (e.g. Kuhl, 2004), especially if there is a predictable socio-emotional valence (Gerhardt, 2010); and the speech is accompanied with gesture (Cunillera et al., 2010). Goodwyn and Acredolo's (1993) original premise was that BS

might assist preverbal infants where various cognitive skills (such as memory, categorization, and symbolization) were *already* in place. The limited use of BS by infants in this thesis might reflect fewer infants in that group with symbolic functioning at the early test phases – thus, BS may not have met their needs. A measure of symbolic development and memory would clarify how infants use BS in future groups.

The role of consistency

One possible factor influencing the success of any intervention relates to the systematicity with which the techniques are employed. In experiments investigating word-image associations, Houston-Price et al. (2006), found that infants had a strong preference for consistency between the two when they were presented. IDS and ENV are likely to facilitate better consistency than BS unless the parents are highly-motivated. Consistency in the presentation of specific 'signs' with a verbal label for specific objects may have lent these gestures meaning, whereas inconsistent patterns may have been perceived by the infant as concurrent but irrelevant behavioural actions. The findings of Gogate et al. (2000) and McNeil et al. (2000) support this supposition. Moreover, McNeil et al.'s (2000) findings may also show how age and cognitive developments affect how an infant perceives BS. One infant in the BS group of the current study frequently looked away during BS presentation or physically lowered the parent's hands. As Tsao et al. (2004) have suggested that speech perception at 6 months predicts language development between 12-24 months, this could imply that infants already segmenting the speech stream successfully (albeit with potentially rudimentary meaning) at an earlier age may be able to use the 'signs' as additional cues, or contrastively, infants already moving beyond the multimodal period may ignore the

gestures offered, finding them distracting. Further investigation is necessary, of how parents use BS and whether an infant's affective state or speech parsing, affect the outcomes of the intervention.

The context of others

This thesis study was unable to measure comprehension *directly* beyond TP1. An investigation of BS 'signs' *understood* by such infants beyond this time-point is necessary to highlight the nature of concept/representation encoding involved in BS as this may not translate into analysis of subsequent verbal production. Several parents in the BS group remarked that their infant referred to them for BS but did not produce it actively themselves. In this sense, a rigorous test of comprehension based on spatial relations at later stages could help identify the types of mental representations which infants form. If these are based on spatial and facial cues rather than aspects such as iconicity (and findings from Kuczaj et al. (2005) and Cheek et al., (2001) imply that more sophisticated levels of representation do not occur until later) the similarity across the groups may actually mask subtle differences at these foundation levels. By investigating the types of encoding involved it might be possible to identify underlying mechanisms which in turn could assist in devising language programmes for children suffering deviance or delay.

Soderstrom (2007) suggested that age, the infant's level of language development, the context and the type of interaction and the interlocutors involved all influenced an infant's bias towards the language environment and how s/he exploited it. Gesture, like speech, gains meaning *within* the pattern of familiar interactions *with* that person and *in*

that environment. Gestures appear to offer skills which both encourage and go beyond language acquisition: they offer the infant a window into embodied intent (Yu et al., 2005), they support the development of selective attention (Bahrick and Lickliter (2000 & 2004)), and they reinforce knowledge stemming from sensori-motoric experiences and interactions with the social and physical environment (e.g. Mizuguchi & Sugai, 2002). Yet, the infant is a social being. S/he engages with others to learn about these worlds and the meanings formed are within an interpersonal domain. This is not the Piagetian creator but a Vygotskian co-creator. It became clear during interactions that some infants were more prepared to use BS with the researcher than with the parent. This suggests an understanding of how the interaction tends to unfurl. An individual who is seen *only* in the context of play and sign (i.e. the researcher) seems to demand a different type of interaction to a parent who is seen in many different contexts – often not using BS. An infant observing and evaluating intent is bound to come to different conclusions regarding the necessity for their own BS production.

Thus, it is argued here that the interaction between parent and infant, the promotion of good intersubjectivity, joint attention and following the infant's lead, had a positive effect on creating meaningful familiar routines and play. The interpersonal meanings and intents we create impact on how we communicate with each other. What does this suggest about the locus of language acquisition? The argument here is that affect, cognition, motivation and learning intertwine within the language acquisition process – and this requires the harnessing of many areas of brain architecture to fulfil the function.

Domain-generality

The multi-faceted nature to language acquisition supports a domain-general perspective. Cognitive, socio-emotional and linguistic developments affect each other. As all intervention types used in the current thesis appeared to benefit infants in terms of language acquisition, there is a suggestion that different mechanisms can be exploited. A proviso to this, however, is the difficulty in knowing exactly how these results compare to the non-intervention group. In this latter group it is unknown how often parent and infant were able to play, or the quality of that play. Nevertheless, it seems plausible that the interpersonal dynamics of interaction have a crucial part in the process.

Of course, there are different interpretations of a domain-general perspective to language acquisition. Compare the Intentionality Model and its emphasis on the infant's self-directed autonomy (Piagetian 'child as creator') to Tomasello's user-based theory of language acquisition ('child as co-constructor'). The former suggests that motivation for linguistic advancement stems from the individual child – a predominantly biological/cognitive drive; the latter highlights the importance of interaction to the linguistic process in terms of pattern-finding and intention-reading during familiar routines and interactions – a predominantly socio-cognitive drive. It is argued here that the latter interpretation better explains the infant's perception of parental intent (and potential meaning) as it is better facilitated in language associated with routines or familiar actions (e.g. 'let's go!') than in a single word attributed to an object. Phrases entail richer socio-cognitive cues which facilitate the infant's alignment of attention and affect whilst single words retain a greater degree of ambiguity. Indeed, Bannard and

Matthews (2008) found that infants store familiar phrases first, rather than individual words, in the earliest stages of language acquisition. Many of these were based on sensori-motoric and action routines experienced with significant others.

Hypothesis 2 predicted that based on previous research all intervention groups would have better language development in terms of production (as measured by the MCDI and video footage at two later time-points). There was a difference between the BS and Non-intervention group at time-point 1 but all intervention groups remained at a similar level of verbal expression and syntactic complexity over the four time-points recorded. The BS infants did not supplement their speech with increased gestural output. Thus, if BS provides benefit, it appears to be limited to comprehension in the earliest stages of language acquisition. This is in-line with Volterra et al. (2006) who had previously suggested that augmentative gesture might help infants' comprehension between 12-15 months in age; and it is in-keeping with the view that speech and gesture share the same underlying system.

The mechanics of language production

Why might BS infants be found to produce no more language in 'sign' or verbally than any of the other intervention groups used in this study? Underlying language production is an awareness and understanding (implicit or otherwise) of how communication works. In terms of comprehension, the infant needs to build up and construct a representation of an object/event and retrieve that with contextual cues. Referential pointing facilitates the planning and execution of a statement which has intent, a shared context and common ground between interlocutors. As such, it is a speech act with the

infant intending to refer to something s/he has shared/wants to share with another person (thereby directing attention or giving commentary to); or to discover information about an object/event in the immediate environment (interrogation). Thus, the infant must be not only aware of his/her own physical environment but be aware that s/he has shared this with another, that the latter will hold the relevant information (thereby recognising that the parent has a different mind to his/her own); and pointing can alleviate the infant's lack of knowledge/need to communicate because the parent will understand the infant's gestural intent. This already involves much cognitive skill.

For an infant to utilise a BS 'sign' instead of a point, s/he must be able to add to this sequence an ability to retrieve the appropriate one, execute it and apply it both appositely and correctly (forming the correct handshape, in the appropriate location, and with the right movement). It is unsurprising that the frequent handshapes seen are those for '5', 'O', and 'B' (which are common handshapes in typically-developing infants used for waving, reaching, and pointing). Just as the speech stream is composed of building blocks (such as phonemes), so too is BSL (e.g. Anderson, 2006). Infants of Deaf parents use manual babbling to practise and construct this framework, utilising statistical probabilities just as hearing babies do with speech sounds (Spencer & Harris, 2006). There was no evidence of manual babbling in any of the BS infants in the thesis study. This implies that the technique was not seen in linguistic terms by the infants, thereby potentially strengthening the argument for a perceptual salience role it might have provided (i.e. attention-related rather than language-linked).

Gesture production

Each of these groups had focused on different aspects relevant to language learning, fostering varying degrees of attention to nonverbal and verbal elements. Gesture is a prelinguistic essential (e.g. Blake et al., 2005; Cheek et al., 2001; Goldin-Meadow & Morford, 1985; Iverson & Goldin-Meadow, 2005), preceding verbal output, and subsequently combining with first words in the infant's production (e.g. Capirci et al., 1996) but infants shift away from gestural dominance by the age of 20 months (Capirci & Volterra, 2008) and therefore any early advantage appears to diminish.

Rowe et al. (2008), suggesting that gesture predicted subsequent vocabulary development, found that it was the amount of gesturing an infant did at 14 months which influenced this result – and this in turn was influenced by the amount of parental gesturing when the infant was 14 months' old. Beyond this timeframe there appeared to be little influence. Thus, gesture seems to play a core role in establishing language acquisition but then takes a supporting position as speech develops. This does not undermine the importance of gesture to language development. Even blind and visually-impaired children produce gestures when communicating, despite being unable to see them (e.g. Dunlea, 1989; Iverson & Goldin-Meadow, 1997), therefore gesture seems to provide benefit to the speaker as well as to the interlocutor (Iverson & Goldin-Meadow, 2001). The point here is that gestures at a preverbal stage may assist the infant to develop an understanding of perspective, self and other, as well as help in encoding conceptual thought –a much broader remit than labelling alone. Crais et al. (2004) argue that gestures have a hierarchical developmental structure which helps infants develop an increasing understanding of intentionality. By providing a framework to scaffold these

experiences, parents ensure that their child has access to the range of socio-cognitive experiences in which cultural knowledge and emblems are only a part.

Thus, the function of general gestural behaviour, such as pointing, and the labelling function of BS are quite distinct. Pointing adopts an increasingly more complex syntactic function as the infant graduates from one-word to the two-word stage (e.g. Caprici & Volterra, 2008; Volterra et al., 2006); this is not the case with BS. There is only a little evidence of hearing infants combining BS 'signs' to create larger syntactic units (e.g. Doherty-Sneddon, 2008 – cf. §4.2.2, p 101). So, what function may BS play? Tolar et al. (2007) suggest that iconic recognition does not develop to a consistent level until at least 3 years of age. This implies that, when successful, BS is not necessarily fulfilling a symbolic representational role beyond the on-going dialogue and interaction – rather it may be enhancing socialization and bonding practices between parent and child. The latter of these is also a by-product of the other types of intervention used in this study.

Parental dialogue

Targeted intervention was predicted to evidence more dialogue. In this study, parents in the BS group appeared to have substantially less dialogue than parents in either of the other two intervention groups. As BS is a keyword technique, any use of it should *not* have replaced verbal output. Any argument about parents using sign without speech should therefore be irrelevant here. Replication of these findings is necessary to substantiate whether this was an artefact of the current study.

If the findings are supported, different interpretations are plausible. Some parents may have felt inhibited and self-conscious using BS, not only in front of the camera but within a wider family context. At least half of the parents in the BS group implied that they were the sole provider of BS to the infant. If so, lack of exposure and productive constraint may have created decoding difficulties. Soderstrom (2007) mentions very long or whispered utterances in IDS which tended to be self-directed talk more than utterances targeted at the infant. Although, this was not particularly evident in the EV group of this study, any productive constraint in BS usage could have equated to Soderstrom's finding: BS' infants may not have interpreted such 'signing' for them.

Additionally, there were researcher effects, with several of the parents commenting on being unable to 'sign' fluently and consistently. This was not the researcher's intention as BS does not require the level of skill necessary for fully-fledged sign language. Nevertheless, as the researcher visited all three intervention groups, there were no marked differences in effect across them in terms of linguistic scores. Overall, the suggestion is that BS did not detract from the infants' linguistic development or environment but it did not enhance it beyond the other interventions either. The finding that both the range and amount of language was less than that for the other intervention groups is curious. It could suggest that some parents in this group may have had to work additionally hard to remember specific 'signs' based on BSL and this increased the cognitive load. This is not something that would be an issue in the symbolic gesturing category. Yet, many of the BS classes offered in the UK are based on BSL signs so this trend may not be helpful.

Alternatively, lower output might reflect a parental attitude towards the expected impact BS might have. The researcher was aware of some parents scaffolding less, allowing the infant to direct the interaction more. Whilst this may be helpful once routines are established, the infant needs some guiding framework at first otherwise s/he may not be aware of the parent's potential as a play/interactive partner. Communication and interaction are interpersonal activities from which we learn together. A parent may over-judge the infant's capabilities initially because of their expectations of a technique and thereby not provide the framework needed for subsequent developments to occur as smoothly.

Equally, there may have been a higher level of infant input to the dialogue. The current study did not analyse infant nonverbal behaviour across the groups beyond TP1 and therefore exact comparisons are unknown. Additional studies are required to resolve this issue. Several of the infants in the BS group did produce 'sign' when interacting with the researcher but not necessarily with the parent. This suggests that they may have seen different functions and intentions in the use of BS themselves. A study of how infants use BS with different people and different skill levels could highlight the infant's understanding of perspective and rules of engagement. Ultimately, the amount of parental output is only relevant in relation to the infant's understanding of communicative intent (Tomasello, 2003); individual differences in this may have had an overall effect on the sensitive parent's dialogue.

Unfortunately, the study severely lacks information from the non-intervention group which might have highlighted where the various interventions had most impact. Data on the amount of play the non-intervention group engaged in every day would have

209

clarified effects greatly. Insofar as it is possible to judge, findings do re-emphasise the importance of holistic gesture to the language acquisition process, not necessarily to the teaching of specific 'signs'. It may allude to the important *context* of playful interaction/engagement, whether through daily routines, or formal play, although better controls are required to qualify this. Play and routinization have been emphasised by scholars such as Bruner who proposed the key role parents play in language development. He declared communication as a negotiated act but one in which the parent played a greater part until the infant was capable of taking on more initiative for the direction of the dialogue. He highlighted the scaffolding role of parents within play, a derivation of sensitivity to the Zone of Proximal Development (Vygotsky, 1962). Crucially this sensitivity originates from the joint experiences and co-constructed meanings the parent and infant create ***together*** in the context of play and interaction. Equally, these meanings relate to the wider socio-cultural environment within which the dyad exists. Thus, play should create the framework for symbolic, linguistic, pragmatic, cognitive and socio-emotional processes to develop. Yet, play is often generally underestimated, especially due to the many pressures which are common in modern life. Further investigation of how play is used with different types of intervention could illuminate which mechanisms operate in each condition.

Assessment weaknesses

The study findings could be criticised of course due to their basis in parental reports, especially as the groups were small. However, the internal reliability of scores across time-points suggests scores were valid. Most parents found the questionnaires accessible, although some were reluctant to respond to the more technical aspects in the

later forms which dealt with complex utterances and syntax. This led to fewer responses for these measures and therefore results require cautious interpretation. Nevertheless, video clips of the infants at later stages supported the assertion that the intervention groups were similar in these more grammatical abilities. Weaknesses remain, however, in that it was not possible to obtain video footage of the Non-intervention group; and it was not possible to video all of the infants within a similar time-span of one-two months due to geographical spread, illness, and holidays. If it had been feasible to do so, much more of the later video data could have been utilised.

Group allocation problems

The Non-intervention group does present several difficulties when interpreting data. The researcher did not visit this group as most parents only guaranteed their participation without this. Thus, there may be differences in motivation, even though all parents volunteered and expressed an interest in the full study. The preponderance of males also meant that any comparisons had to be conservative. However, the relatively static pattern of data for this group lends support for the contention that intervention was beneficial, especially when considering that the older age range should have placed the Non-intervention group more on a par with the intervention groups. The slight upturn at TP3, especially for words produced, might reflect a change in childcare arrangements or a latency effect but without video data this is impossible to untangle. Notably, however, the Non-intervention group remains at a lower percentile than the intervention groups.

Alternatively, the similar patterning for syntactic development and gesture use implies similar developmental impetuses underpinning these skills. Ultimately, the fact that the Non-intervention group trailed the other groups across the time-points in terms of comprehension and production reinforces rather than detracts from the assertion that dyadic interaction is vital within the language learning process, regardless of how it is managed. Some time to play, including during routines, such as dressing, bathing, or feeding, create a joint attention format in which the infant learns. Joint attention and coordinated joint play will be dealt with more fully in the next chapter.

Study issues

There are several major provisos which affect any interpretation of the current data. Due to attrition and missing information, effect sizes were small, particularly so for gauging intervention group differences as well as interaction effects, and the parental output data. This means that there is a possible chance effect operating in either direction. The longest utterances' information which required four imputations for the BS group may have concealed potential differences. Power levels were also lower than desired for some of the analyses, although they were often sufficient to perceive effects, especially in terms of comprehension differences. Above all, overall attrition was not exceptional for a longitudinal infant study of this nature, and missing data are a common occurrence in such studies.

As many BS classes are based on BSL variants, why may this be even less successful than the 'symbolic gesturing' advocated by Acredolo and Goodwyn? Several possibilities exist to explain this. Firstly, the signs are not created by the infants

themselves and therefore motivation for using them may be less obvious, unless the parent's motivation spreads to the child. Secondly, Deaf parents of deaf infants are reported to use sign initially but communicate using a higher level of pointing (e.g. Spencer & Harris, 2006). This may be due to the level of iconicity and abstraction in some signs. Moreover, Deaf parents are aware of the need to develop intersubjectivity, joint attention, and coordinated joint engagement with their infant. Without shared attention it is difficult to communicate, and as Tomasello pointed out, following the infant's attention and making comment is more successful than directing attention or giving a sequential commentary. Ultimately, a parent will have a solid basis for good attunement and intersubjectivity if s/he engages in play, establishing predictable routines in which the infant can develop an understanding of intentionality and symbolic interpersonal meaning – and by maintaining flexibility to follow the infant's source of attention.

Another potential weakness in the study is a lack of control for general infant ability. The researcher did set out to include a test of general ability (*The Transdisciplinary Play-based Assessment*) which would have accounted for individual differences, including in sensori-motoric and cognitive areas, but time pressures did not allow for these to be completed. Indeed, as families were distributed across a wide geographical area (850 square miles), it was overall administratively problematic to keep assessment points as equivalent as possible in terms of the infants' chronological growth, hence the need to analyse videos from a 17-22 month period. Assessment points at 12-, 18-, and 24-months would have been preferred. Nevertheless, there were no significant differences between participants for SES, or for identified additional conditions noted

from birth therefore individual differences based on general ability were not anticipated to be a problem.

It had been intended to follow the infants' development up to 30 months in age. This would have allowed a later comparison of parental dialogue, when the infants were around 24 months in age, as well as more concise information regarding the infants' syntactic development. Due to attrition and re-recruitment procedures this had not been possible. It had also been planned to do a laboratory-controlled study of perspective-taking across the groups. Again, time limitations prevented this.

Despite these omissions stronger effect sizes for time-point data, as well as the cross-checking of data via several different media do lend some legitimacy to the claim that augmentative gesture may assist in *early* infancy only but that all intervention methods have equipotential. Given that there were no significant differences in SES, birth order, or primary caregiver work patterns, especially in the early stages, the groups were as evenly-balanced as possible. Whilst larger groups, controlled for general development, could substantiate similarities and differences occurring amongst the intervention groups, this would only be feasible with a team of researchers, given the time and geographical constraints, and this adds in a separate confound of researcher differences (especially in terms of working with families, BS skills, gender, and age) which would have to be accounted for.

Analyses of the language data could have been improved if it had been possible to use *ELAN* and if the MCDI did not separate into two different reports. A longitudinal measure of comprehension and gestural behaviour would have been useful beyond TP1

as variability in vocabulary spurts could have affected the data collated on production alone. In addition, whilst the researcher had initially adopted the *Test of Pretend Play* (*ToPP*) to assess symbolic behaviours, this had to be abandoned as time factors affected the researcher's ability to visit all families within a limited timeframe, especially at the later stages.

Discussion of the materials used and the method for dealing with attrition and missing data were made earlier so they will not be dealt with further here. Issues with camera placement and audibility of dialogue are common within these types of study, and therefore these were problematic but no more so than in many home-based investigations. The effect of experimenter input, however, does warrant further exploration. The researcher made an average of 10 visits to each intervention family across the study period. This would have had varying effects according to parental expectations of the study and of the researcher; the quality of interactions between the researcher and parent as well as between the researcher and child; and how the researcher may have presented each intervention – was any positively biased over the others? As each of the interventions had similar outcomes, it is hoped that an impartial presentation did occur; however, with the researcher's strong background in BSL, it is conceivable that some parents may have assumed an inherent positive bias towards BS.

In conclusion there are still some questions surrounding the efficacy of BS but the overwhelming bulk of research suggests that individual differences in small samples may have led to the conclusion that BS is more advantageous than it actually is. Its basis in play routines and interactions suggests that the interactional context underlies its success. Positive intersubjectivity within parent-infant dyads remains to the fore,

especially in establishing mutual sensitivity and joint attention patterns. Given the multitude of pressures parents experience and the pulls on their resources, enhancing play and interactive experiences for the family as a whole is a pursuit which should not be overlooked. Chapter 7 sets out analyses and findings of investigation into the socioemotional development of infants across the intervention and non-intervention groups in the thesis study.

Chapter 7: The Impact of Interventions on Socio-emotional Development

7.1 Introduction

Moving on from the potential *linguistic* benefits of different types of intervention, this chapter engages with a study which investigated possible effects of different interventions on the infant's socio-emotional development. The chapter aims to show how language acquisition is intertwined with socio-emotional processes, and therefore how each impinges on the other. Chapter 1 has already described how developments in the socioemotional and linguisitic realms impact upon the other (cf. §1.8.3 – 1.9.1) and Chapter 3 has defined the attachment paradigm in detail. Consequently these are not reiterated here. Ultimately, as social entities, our relationships with others are important to our well-being, and the overall quality of interactions between infants and their parents is thought to influence the nature of subsequent relationships (see §3.1.3, p 75). Previously, much emphasis was placed on the parent's sensitivity and role in establishing a stable attachment pattern (e.g. De Wolff & van IJzendoorn, 1997). More recently, with greater recognition of this link between socio-emotional and cognitive processes in infancy, wider issues, including the importance of joint attention and coordinated joint engagement, intergenerational effects of attachment behaviours, and the reciprocal nature of creating synchrony within the relationship are also now investigated (e.g. Claussen et al., 2002; cf. §2.4.2 - 2.4.4; §1.11; §3.2). BS' proponents have claimed that the technique enhances socio-emotional development, partly due to its effect on nonverbal behaviours like joint attention (e.g. Moore et al., 2001). However, do other types of intervention have a similar level of benefit? The links between attachment behaviours, socioemotional development and intervention technique are investigated more fully below.

217

7.2 Observing the unfolding of interaction between parent and child

It was against this backdrop that an investigation into socio-emotional development alongside language acquisition was evident. Taking all of the elements outlined above, the play scenario (which was used as the test basis for this study between parent and child) was expected to be punctuated by a joint attention schema, synchronous engagement, and a balance between proximity and exploration. BS claims that the technique would enhance socio-emotional development, with specific reference to joint attention and intersubjective understanding between parent and child (cf. Chapter 4 p 89, Chapter 7, p 191) were expected to be supported. This was partly due to evidence from Vallotton (2009) who had observed that when infants were taught to use specific gestures and signs in addition to spontaneous nonverbal behaviours, such as pointing, carers in a nursery setting were more receptive towards them in routine interactions. Thus, Vallotton's research implied that teaching symbolic gesturing could enhance intersubjectivity overall. BS sites have also claimed benefits to infant confidence and better attunement. As the previous chapter has shown, however, any advantages claimed for BS may be ephemeral and not necessarily attributable to the technique itself, but rather to the interactional format upon which it depends. As play formats were used for all of the interventions, any specific advantage from BS should have been salient.

The study of attachment behaviours and socio-emotional development involved the four groups introduced in the previous chapter. It highlights whether there is a difference between the intervention groups and the Non-intervention group, and thereby reinforces any value of taught intervention methods.

To investigate the nature of play, several aspects were measured. The infant's intent was illuminated through his/her initiation of behaviour in others (Seibert et al., 1982) and showed when they were behaving in a requesting manner (that is, to obtain something which they knew they could not achieve without parental assistance); or when they were jointly engaged in an activity that was essentially interactive (involving sharing some affect, experience, or cognition without a specific end-goal in itself). Joint engagement (JE) was a composite consisting of supported joint engagement (SJE) and coordinated joint engagement (CJE). SJE differs from CJE in that the infant does not engage as fully with the parent as with the toy/event. For example, an infant may be aware of the parent's involvement in building a tower of blocks, and may also turn-take with him/her but s/he does not do so consistently, or look between the parent and the tower to show they have equal importance in the activity. As it was not always possible to observe the infant's eye gaze from one static camera these two types of joint engagement had to be measured together.

The studies aimed to investigate five key areas of socio-emotional development which have links with language acquisition:

- the quality of socio-emotional development, including self-regulation, compliance, and interaction with others (measured by the ASQ:SE, a parental report)

- the nature of attachment behaviours based on the first video set (AQ-Sort)

- the quality of joint attention (JA) (both RJA and IJA).

- the quality of IBR (Initiating a behavioural response) and JE (Joint engagement).

219

- the nature of nonverbal language highlighted in intersubjectivity and maintenance of interaction.

The following hypotheses were made:

- That based on previous research all intervention groups would benefit from enhanced socioemotional development (as measured by the ASQ:SE)

o The BS group - due to the reduction in frustration expressed by an infant who is unable to communicate needs, thoughts and desires to others; and due to improved relationships between parent and child due to better understanding between them (e.g. Goodwyn et al., 2000; Pizer et al., 2007; Vallotton, 2008, 2009, 2011).

o The EV group – due to the stress on positive affect associated with IDS intonation patterns and the tendency towards a lower type/token ratio which assists the infant's understanding and distinction of target words (Soderstrom, 2007); as well as the emphasis on quality interaction between parent and child: good turn-taking, joint attention, and reciprocal sensitivity (Snow, 1972a).

o The ENV group – due to the technique's recognition of the infant as an active agent in their environment (Bloom & Tinker, 2001), striving to act upon, understand and influence the minds of others to achieve needs and goals during communicative episodes. In so doing s/he becomes aware of the needs and goals of others, by interpreting intent from their actions, and realising that these goals do not always match their own, thereby fostering the acquisition of a theory of

mind (Bloom et al., 1996; Bloom & Tinker, 2001; Bloom, 2001; Brackenbury et al., 2005).

- o But that a predicted positive effect in infant confidence building should be reflected in better overall mean scores for attachment behaviours (as measured by the A Q-Sort).

- o And that an emphasis on multimodal cues should further enable the BS group to show increased levels of JA, IBR and JE, with parents in the BS group engaging in more pointing along with keyword 'signing'.

7.3 Methodology

Participants

Recruitment methods have been reported previously in Chapter 5 and are only briefly repeated here. From the original seventy children (39 males, 31 females) aged 9-11 months, recruited over a period of eleven months across the south and central belt of Scotland, 51 (30 males, 21 females) completed three of the ASQ:SE questionnaires. Per group this equated to BS (M = 7, F = 7); EV (M = 7, F = 6); ENV (M = 6, F = 6); and the Non-intervention group (M = 10, F = 2). As some of the infants had missed one form, 10 multiple imputations for the ASQ: SE were used for one female in the EV group (for TP2), and for four participants in the ENV group (M = 3 (1 at TP2; 2 at TP3); F = 1 (at TP3)). As all of these had provided data for a subsequent time-point, the imputations were deemed reliable.

Materials

Social-emotional assessment

Of the normative materials available to measure socio-emotional behavioural patterns, the Ages and Stages: Social-Emotional Questionnaire (ASQ: SE) (Squires et al., 2003) was chosen due to its internal and external validity, ease and quickness of use, and its parental report format (ibid, 2003). It is an American-normed parent report questionnaire, devised as an adjunct to The Ages and Stages Questionnaire which had focused on the wider aspects of early child development, including motor skills, communication, and cognition. The ASQ: SE provided an economical method of evaluating social-emotional development over the study time period (from 12-30 months of age) and ensured that the measures used for analysing socio-emotional behaviour maintained internal validity.

It was administered at six-monthly intervals, giving three time points (ASQ: SE 1 - ASQ: SE 3). Measures included evaluating aspects of infant temperament (self-regulation, compliance, communication, adaptive functioning, autonomy, affect and interaction with other people), as well as parent-infant communication and interaction. Parents responded according to whether their infant rarely/never, sometimes, always/frequently showed certain behaviours. The forms were scored according to a target cut-off point, beyond which the infant's behaviours were deemed to be of concern. These cut-off points differed according to the age range targeted by each form. Parents in this study responded to three questionnaires: one at 12 months (range 9-14 months), one at 18 months (range 15 – 20 months) and one at 24 months (range 21-26 months) respectively.

As indicated previously (Chapter 6), parental reports can be biased, and this can lead to problems in analysing non-linguistic data. To minimise such concerns, the external validity of the ASQ: SE was gauged alongside the Attachment Q-Sort (AQ-Sort). This latter assessment was conducted by the researcher and two independent interraters to create an objective point of reference against which the scores from the ASQ: SE could be measured.

The AQ-Sort – cf. Chapter 3 (§ 3.6)

The structure of AQ-Sort

The Waters and Deane AQ-Sort (1987; cf. Appendix 12) consisted of 90 cards showing a child behaviour description. These cards were allocated to one of three equal piles (30 cards in each pile): most like the child, neither like nor unlike the child, or most unlike the child. Further, more refined allocations then occurred until all the cards had been redistributed into 9 stacks of equal number (10 per pile). Cards in the 9th pile related to those behaviours most like the child, in the 1st to the least. Scores were then attributed to the place of each card from 1-9. A panel of attachment experts had ranked each behavioural item described (correlations emerged ranging from 0.70 to 0.80). An average for each construct (for example all the individual items relating to self-regulation) was taken at a subsequent stage and this gave a correlational agreement of > 0.95.

These scores therefore provided a composite behavioural description of an "ideal child": a child who had a high security but low dependency score. By measuring current participants against the 'ideal', it was possible to investigate patterns of attachment

behaviours across and within the groups. The researcher based Q-Sorts on the participants' attachment behaviours after the first six months of involvement in the study. The interrater viewed the first three videos of the participant and then Q-sorted the cards accordingly.

Attachment behaviours were also measured objectively to ascertain/discern whether there was a link between parental reporting of socio-emotional development and neutral observation of perceived behaviours by an interrater and the researcher.

Parental diaries

A diary (cf. Appendix 8) was given to each parent to record the nature of play interactions between them and their infant over time. Details regarding context, individuals involved, and the types of eliciting behaviours preceding infant verbal/gestural/signed production were noted. Parents were asked to record whether the infant produced a signed/verbal/gestural utterance spontaneously, in imitation, or as part of a well-rehearsed routine (such as a song). This was particularly helpful in identifying play patterns, types of preferred play (physical, constructive, etc.), language used, and whether play sessions were dyadic in nature or involved siblings or other members of the extended family. By referring to the diaries it was possible to gauge how the play was developing between researcher visits, how the BS was being used, and whether play opportunities were presenting themselves on a regular basis.

Video recordings

Alongside the formal written assessments, parents were video-recorded in free play sessions. One of three video cameras was used for this purpose according to availability: a Samsung VP-L906 Hi-8 Analogue Camcorder, and two types of digital camera: the Sony Handycam DCR-SR37E and a Panasonic SDR-S26. The researcher made various developmental stage-appropriate toys (such as bubbles, puppets and dolls, balls, stacking rings) available to the parent and child at each visit but as free play was crucial, parents could use their own toys if so desired. Recordings made between 12-16 months of age formed the basis for the coding of nonverbal parental behaviour across the groups, and early JE by inputting these data into NVivo software. Later videos (18-22 months) were used for IJA, IBR and JE analyses.

Procedure and design

This was a longitudinal mixed design study. The between-participant factor was Group (BS, EV, ENV, or Non-intervention) and the within-participant factor was Time-Point (TP1, TP2, and TP3). Socio-emotional data were analysed over time via a two-way ANOVA (group (4 levels) x time point (3 levels)). *GPower* was used to calculate a priori the sample size required for this type of ANOVA, the effect size set at $f = 0.5$ (a medium size), the α error rate at 0.05, the power level at 0.95, the number of groups at 4 and the number of measurements at 3. This resulted in a minimum recommended sample size of 52 participants required. Some missing data occurred, therefore multiple imputations were employed. In Table 11 below is a list of how these measures were conducted along with the nonverbal behavioural analyses.

Table 11: All socio-emotional and behavioural measures used in the longitudinal study

Measure	Source material	Score	IOR
Socio-emotional behaviours	ASQ:SE 12-mth questionnaire (range 9-14 mths)	Normed	n/a normed score
	ASQ:SE 18 mth questionnaire (range 15-20 mths)	Normed	n/a normed score
	ASQ:SE 24-mth questionnaire (range 21-27 mths)	Normed	n/a normed score
Attachment behaviours	Attachment Q-Sort	Based on first 3 x1hr videos taken (infants 10-18 mths)	16% inter-rated. Security scores agreement: $r = 0.85$, $N = 6$, $p = 0.03$ Dependency scores agreement: $r = 0.82$, $N = 6$, $p = 0.045$
Joint engagement	10 min video clips btw parent-child	One clip when infants btw 12-16 mths	27% inter-rated $r = 0.78$, $N = 12$, $p = 0.003$
Initiating joint attention	10 min video clips btw parent-child	One clip when infants btw 18-22 mths	23% inter-rated. $r = 0.95$, $N = 7$, $p = 0.004$
Joint engagement	10 min video clips btw parent-child	One clip when infants btw 18-22 mths	23% inter-rated. $r = 0.81$, $N = 7$, $p = 0.03$
Initiating behavioural response	10 min video clips btw parent-child	One clip when infants btw 18-22 mths	23% inter-rated. $r = 0.88$, $N = 7$, $p = 0.009$
Parental nonverbal behaviours (including pointing)	10 min video clips btw parent-child	One clip when infants btw 12-16 mths	Inter-rated for parental gesture: $r = 0.99$, $N = 6$, $p < 0.001$; for parental verbal imitation: $r = 0.95$, $N = 6$, $p = 0.004$; and for parental nonverbal imitation: $r = 0.99$, $N = 6$, $p < 0.001$

The researcher visited each participant weekly for the first month, modelling the allocated communication technique. Duration of visits was 45-60 minutes, and the researcher provided age-appropriate toys. Parents in the BS group were given a DVD of

baby signs, and a folder of photographic stills showing the same signs in 2-D as a quick reference guide. Parents in the EV group received a folder with information explaining what 'parentese' was, and parents in the ENV group were given a folder with a summary outlining the principle underlying the Intentionality Model. All parents in the intervention groups were given a paper diary (as well as one in electronic format if requested) to record their interactions and were asked to play with their infant for 20 minutes a day. It was emphasised that such play might occur during daily routines, such as getting dressed, nappy changing, bath-time, and mealtimes. After the first month visits reduced to once every two months for six months, before reducing again to a visit six months after the previous visit. Parents received 10 visits each in total. The researcher also set up a blog site for all intervention parents in the study to communicate with each other if they so wished.

Like the MCDI parental reports, the researcher asked the parents to complete the ASQ: SE forms during separate visits, until later in the study when they were sent out by surface mail or sent to the participants electronically. Video recording took place in the home. The researcher set up the video camera ensuring that the parent and infant were captured within shot then left the room. Play interaction between parent and infant was recorded for a minimum of 5-10 minutes at which point the researcher re-entered the room. The recording continued throughout the session, although only the 10 minute clips were used for language analysis.

AQ-Sorts were conducted by the experimenter and subsequently by the interraters using the first three videos.

Social-emotional analyses

Scores from the parental report ASQ: SE provided data for between-group comparison as well as highlighting any individual threshold concerns. Discrete areas, including self-regulation and compliance were isolated to compare groups and individuals over time. This was to indicate whether particular intervention methods had a particular effect on specific areas of social-emotional development. AQ-Sort scores were collated and compared to those of the ASQ: SE to investigate any differences in scoring.

Interactional (behaviour) recording

Test sessions were video-recorded in the infant's own home according to the timescale mentioned previously. A box of developmental stage-appropriate toys was provided, including books. The names of all of these toys appeared in the vocabulary list given to the groups at the start of the study. However, to keep the infant's interest, parents were allowed to introduce the child's own toys if they were less captivated by the study offerings. Songs also formed part of the repertoire.

The parent and infant were filmed for at least 10 minutes on their own, wherever possible, but at times young siblings were also present during filming. To assist with interrater observations of the infant's attachment behaviours, the video continued to record throughout the researcher's hour-long visit. This included joint play sessions between the child, parent and researcher; the parent, siblings and participant child, or both parents and child.

Interactional (nonverbal behaviour) analyses: Initial codings

Video recordings (ten-minute video samples from TP1) were used to analyse joint attention behaviours between parent and infant. They were taken from the first 10 minutes parents and infants spent in play together and were uploaded to the *NVivo* software program. As the infants were 12-16 months at this point it was decided not to subdivide JA into responding to joint attention (RJA) and initiating joint attention (IJA) in accordance with Mundy et al.'s (2007) findings regarding a dip in IJA during this age range.

Interrater reliability – see Chapter 5

Parental diary analyses

In order to gauge how parents were playing with their infant (for example as a dyad, with siblings, in specific routines, etc.) they were asked to keep a diary. Many found this difficult due to demands on their time. Consequently diaries were received from the following only: BS group = 6/14; EV = 7/11; ENV = 8/10. Diaries were investigated for duration, and types of activity highlighted.

Analysing the data

The study provided a plethora of rich data in a variety of media formats (video, paper, standardized parental reports, observational). Consequently responses were analysed in several different ways.

Video recordings: transcription and coding of parental output

Initial video recordings, which were completed on Hi-8 video tapes, required to be transferred to DVDs for transcription and coding. Subsequent recordings were possible in digitized format and could therefore be transferred directly onto a PC. A Pentium (R) Dual-Core CPU T4200 laptop computer using the Window XP operating system was used as the predominant source for this purpose. *NVivo* software was used from this point for transcription and coding of the subsequent video recordings. This software was chosen as it enabled the importation of video material, minimising the distance from source material as much as possible, and thereby keeping the transcription and coding as accurate as possible. Other software considered, such as *Atlas-ti*, could not incorporate video material and was therefore discounted at an early stage.

Statistical analyses

SPSS 17 on a laptop computer provided the means to analyse the quantitative data. A two-way ANOVA with a within-participant factor of Time-Point (3 levels) and a between-participant factor of Group (4 levels) was implemented for analysis of the Ages and Stages Questionnaire: Socio-emotional data. Bivariate Correlations were completed on the interrater and researcher data for the ASQ: SE, Joint Attention and Coordinated Joint Play measures. Correlational analyses were conducted on the ASQ: SE and AQ-Sort data with the MCDI and the JA/IBR/JE observational data. One-way ANOVAs were computed for the AQ-Sort data.

Methods employed to account for missing values (missing forms) have been reported in the previous chapter. In the current study, some of the missing data related to parental

uncertainty regarding the reporting of syntactic development, the M3L data. This was, therefore, not random.

Moreover, the most common method, listwise deletion, reduces power and on such small groups this was not an option (DuBois Bowman, 2004). It had been intended to investigate a withdrawal control comparison (Widaman, 2006) at the end of the study but only 6 of the 12 participants responded therefore the sample was too small. By using multiple imputations it was possible to avoid underestimating the standard error rates (Howell, 2009), and also deal with multivariate data.

Results

Behavioural analyses: Socio-emotional development

Figure 11 below shows a bar chart of the scores derived from the Ages and Stages Questionnaire: Social-emotional (ASQ: SE) across the three time points.

Figure 11: Mean Point Scores for the Ages and Stages Questionnaire: Socio-emotional
– All Groups
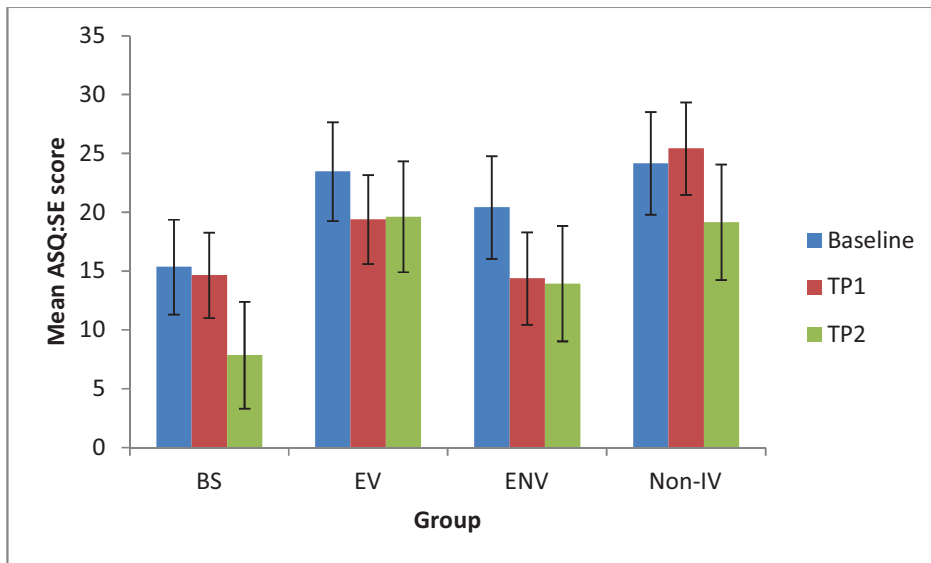
Table 12: Means of ASQ: SE point scores across groups Baseline to TP2

Group	Baseline	Time-Point 1 (TP1)	Time-Point 2 (TP2)
BS	15.36 (SD = 12.78; SE = 4.04)	14.64 (SD = 12.32; SE = 3.64)	7.86 (SD = 9.35; SE = 4.55)
EV	23.46 (SD = 15.73; SE = 4.20)	19.39 (SD = 13.56; SE = 3.77)	19.62 (SD = 24.87; SE = 4.72)
ENV	20.42 (SD = 15.73; SE = 4.37)	14.38 (SD = 9.54; SE = 3.93)	13.95 (SD = 8.48; SE = 4.91)
Non-intervention	24.17 (SD = 16.35; SE = 4.37)	25.42 (SD = 17.90; SE = 3.93)	19.17 (SD = 19.64; SE = 4.91)

Figure 11 reveals improved scores for all of the intervention groups between Baseline
and TP2 (**the lower the score, the better the socio-emotional rating**). The Non-
intervention group is fairly static until TP2. Table 12 shows a plateauing effect between
TP1 and TP2 for the EV group in terms of score but a substantial increase in the amount
of standard deviation within the group. There is a similar pattern in the ENV group,
although less standard deviation. Whilst the Non-intervention group's point-score

232

decreased, there continued to be great variation within the group itself. A Mauchly's test showed that sphericity across the time-points was not significant: p = .27.

A two-way ANOVA with between-participant factor of Group (4 levels) and a within-participant factor of Time-Point (3 levels) showed a significant main effect of Time-Point: $F(2, 94) = 4.14$, $p = .02$, $\eta^2 = 0.08$, $\delta = 0.72$ (Total Mean at Baseline = 20.69; at TP1 = 18.33; and at TP2 = 14.95); but not of Group: $F(3, 47) = 1.67$, $p = .19$, $\eta^2 = 0.10$, $\delta = 0.41$. There was no significant interaction between Group and Time-Point: $F(6, 94) = 0.57$, $p = .75$, $\eta^2 = 0.04$, $\delta = 0.22$. A Bonferroni pairwise comparison showed that the significant difference for Time-Point was between Baseline and TP2: $p = .02$.

In line with the a priori hypothesis, planned comparisons were completed to investigate where any differences arose. There were no differences between any of the intervention groups and the Non-intervention group at baseline (although there was a trend between the first pairing: BS and Non-intervention group: $t = -1.54$, $df = 24$, $p = .07$, one-tailed); EV and Non-intervention group: $t = -.11$, $df = 23$, $p = .46$, one-tailed; ENV and Non-intervention group: $t = -.57$, $df = 22$, $p = .29$, one-tailed). At TP1 there was a significant difference between the mean point scores for the BS and Non-intervention group: $t = -1.81$, $df = 24$, $p = .04$, one-tailed; and between the ENV and Non-intervention group: $t = -1.89$, $df = 22$, $p = .04$, one-tailed. At TP2 there was a significant difference between the BS and Non-intervention groups: $t = -1.83$, $df = 15.2$, $p = .04$, one-tailed. None of the other results were significant. **Brief Summary**: the hypothesis that the BS, EV and ENV groups would show socio-emotional benefit from intervention over the Non-intervention group across TP1 and TP2 was not supported. Only the BS and ENV groups showed significant mean score differences from the Non-intervention group at

TP1; and by TP2 only BS infants continued to evidence this result. Whilst the general trend for all groups was towards the achievement of lower (i.e. better) scores over time (including the non-intervention group), the BS group did show consistent benefit from the intervention.

Threshold concerns highlighted by the ASQ: SE

The ASQ: SE questionnaire was used to compare mean scores across groups. However, it also highlighted individual results, indicating whether any infants were over a relative threshold score for concern. It was not anticipated that these scores would be high. The figures are shown in Table 13 below.

Table 13: Participants Over Cut-Off Threshold for ASQ: SE

Group	12-mth over threshold	18-mth over threshold	24-mth over threshold
BS	0 (*N*=14)	0 (*N*=14)	0 (*N*=14)
EV	1 (*N*=13)	0 (*N*=13)	2 (*N*=13)
ENV	1 (*N*=12)	0 (*N*=12)	0 (*N*=12)
Non-intervention	1 (*N*=12)	1 (*N*=12)	1 (*N*=12)

The above data show that the majority of infants in all groups were below or at threshold. There are few differences amongst the groups, and for most, as communication skills improved, along with parental confidence, scores for socio-emotional development improved, too. None of the results were surprising, even the increase at 24-months in the EV group. It is important to point out that in most cases it was not the same child who arose across all three time points as a concern. This reflects

the dynamic nature of socio-emotional family life: that various events impinge upon the family network at different times.

Testing the internal validity of the ASQ: SE

Correlations were completed between the different levels of the ASQ: SE used in the current study. It was found that Baseline to TP2 responses were significantly correlated to each other:

ASQ: SE 1 to ASQ: SE 2: $r = 0.63$, n = 54, $p < .001$, two-tailed.

ASQ: SE 2 to ASQ: SE 3: $r = 0.51$, n = 54, $p < .001$, two-tailed.

ASQ: SE 1 to ASQ: SE 3: $r = 0.61$, n = 54, $p < .001$, two-tailed.

This suggests that the ASQ: SE questionnaire held internal validity throughout the study, and showed that parents were consistent in their responses. It is a positive finding, particularly considering the significant correlation at TP2 which implies that bias/practice effects were not necessarily an issue in the ASQ: SE at the latter stages. This might have arisen if a substantial number of the parents had answered according to what they assumed were the preferred responses. In addition the ASQ: SE at TP2 was significantly correlated with the AQ-Sort Security scores: $r = -0.56$, n = 39, $p < .001$, two-tailed. This was not anticipated as AQ-Sort scores were based on the earlier observational periods. It does enable speculation, however, that the AQ-Sort security scores were reliable of later socio-emotional behaviours.

Correlations between the ASQ: SE and MCDI measures.

There were no significant correlations between the ASQ: SE and MCDI scores. These data are reported in Table 14 below.

Table 14 Correlations (not significant) between ASQ: SE and MCDI

Assessment material	ASQ: SE 1	ASQ: SE 2	ASQ: SE 3
Words Understood Baseline	$r = .10, n = 54, p = .49$	$r = -.44, n = 52, p = .44$	$r = .22, n = 54, p = .10$
Words Understood TP1	$r = .09, n = 52, p = .53$	$r = -.22, n = 52, p = .12$	$r = .05, n = 52, p = .71$
Words Produced Baseline	$r = .19, n = 54, p = .18$	$r = .04, n = 52, p = .80$	$r = .16, n = 54, p = .25$
Words Produced TP1	$r = .13, n = 52, p = .35$	$r = -.13, n = 52, p = .37$	$r = -.05, n = 52, p = .74$
Words Produced TP2	$r = -.08, n = 52, p = .58$	$r = -.05, n = 52, p = .70$	$r = -.21, n = 52, p = .13$
Words Produced TP3	$r = .05, n = 54, p = .74$	$r = -.04, n = 52, p = .80$	$r = -.14, n = 54, p = .32$

Table 14 shows there were no correlations between MCDI and ASQ: SE measures. Whilst it is anticipated that socio-emotional behaviours are linked to language acquisition, it is conceivable that these particular measures were either too insensitive to identify such links or were too wide-ranging to isolate them. A measure of interacting and communicating with other people (a particular strand within the ASQ: SE) may have achieved this better.

AQ-Sort Data

The Attachment Q-Sort data were then investigated for a comparison of mean attachment scores for security and dependence across the three intervention groups.

Data were unavailable for the Non-intervention group due to the lack of video material. The mean Pearson statistic for each group is shown in Table 15 below. These statistics are based on the video material (play sessions with parent) given to interraters to score.

Table 15: AQ-Sort mean Pearson statistic per intervention group

Group	Mean security score (Pearson statistic)	Mean dependency score
BS (N =14)	.650 (SD = .13; SE = .04)	.006 (SD = .16; SE = .04)
EV (N = 11)	.503 (SD = .23; SE = .06)	.022 (SD = .09; SE = .02)
ENV (N = 12)	.591 (SD = .19; SE = .05)	.015 (SD = .26; SE = .07)
Total (N = 37)	.587 (SD = .19; SE = .03)	.001 (SD = .18; SE = .03)

Table 15 shows that the intervention groups were fairly evenly-matched for the AQ-Sort security and dependency scores. A One-way ANOVA supported this with no significant differences apparent between the groups. For the security score: $F(2, 34) = 1.95$, $p =$ .16, $\eta^2 = 0.01$; and for the dependency score: $F(2, 34) = 0.12$, $p = .88$, $\eta^2 = 0.01$. The AQ-Sort works on the basis of comparing a study child's scores against those of an ideal secure child. The majority of infants in this study correlated significantly to the exhibition of secure attachment behaviours. Only four infants mapped significantly to the AQ-Sort score of an ideal dependent child. **Brief summary**: the hypothesis that the BS group would show more secure attachment behaviours than the other groups was not supported.

Links between the AQ-Sort and Language Measures from MCDI

Further correlations were completed on the AQ-Sort data, especially with the language

measures from the MCDI. Table 16 shows where significant results were found.

Table 16: Significant correlations between AQ-Sort, Language and Socio-emotional
Measures

Assessment material/ Result	MCDI: Words Produced TP2	MCDI: Words Produced TP3	MCDI: Syntactic Complexity	MCDI: 3 Longest Utterances	Attachment Q-Sort: dependence score	ASQ: SE TP3
AQ-Sort: security score	$r = .44$, $n = 39$, $p = .005$	$r = .32$, $n = 39$, $p = .045$	$r = .77$, $n = 38$, $p < .001$	$r = .34$, $n = 38$, $p = .04$	$r = -.36$, $n = 39$, $p = .025$	$r = -.56$, $n = 39$, $p < .001$

These results do lend support to arguments that attachment and social-emotional

behaviours are associated with language acquisition.

Links between the AQ-Sort, ASQ: SE and nonverbal behaviours associated with intersubjectivity and attunement

Data from video clips when infants were 12-16 months' old enabled investigation of

possible correlation patterns between Attachment Q-Sort security ratings, ASQ: SE

scores, and observed frequency levels of JA. Significant findings are shown in Table 17

below.

Table 17: Correlational Analyses from Video Clips (12-16 mths and 17-22 mths) for JA with AQ-S and ASQ: SE

Assessment material/Result	Duration of JA (joint attention in secs)	Duration of JE (joint engagement SJE + CJE in secs)	Frequency of IJA (Initiation of joint attention)
AQ-Sort: security score	$r = .49, n = 18, p = .04$	$r = .69, n = 32, p < .001$	$r = .37, n = 30, p = .045$
Duration of JA (joint attention in secs)		$r = .53, n = 17, p = .03$	

Brief summary: Attachment behaviours as measured by the A Q-Sort do correlate with JA, JE, and IJA. There were no significant correlations for the AQ-Sort dependency score and IJA: $r = -0.03$, n = 30, $p = .87$; or for any of the ASQ: SE time-points and IJA:

ASQ: SE 1 and IJA: $r = -0.01$, n = 30, $p = .96$

ASQ: SE 2 and IJA: $r = -0.12$, n = 30, $p = .55$

ASQ: SE 3 and IJA: $r = -0.21$, n = 30, $p = .27$

The difference in results between the AQ-Sort and the ASQ: SE is not surprising as the AQ-Sort targets more specifically the areas of security and dependency whereas the ASQ: SE is more generic. The correlations between JA, JE and AQ-Sort security scores does not offer illumination in terms of causality but does support the suggestion of strong links amongst them.

Parental diaries

Only 21 parental diaries were received (BS = 6, EV = 7, ENV = 8). These parents maintained them for a mean duration of BS = 157 days; EV = 219 days; and ENV = 158 days. The diaries recorded activities when parents employed the intervention technique specific to their group. These were collated and the most common activities extracted to investigate play patterns across all the groups. These amounted to mealtimes, bedtime, bathtime, getting ready, singing, book-sharing, household chores, and specific games, such as hiding, block play, object play, bubbles, and passing games. There were no significant mean differences between the groups for the types and frequency of activity chosen (ranging from p = .24 for using the intervention when book-reading to p = .96 for block play). Trends showed that more parents in the EV group highlighted utilising the intervention during mealtimes, songs, and object play with their infant, as well as when undertaking household chores. ENV parents were proportionately more likely to mention engaging the technique during physical activities, such as passing games, tower building, or hiding (self or object).

Every responding parent in the ENV group mentioned book sharing (as opposed to 86% of EV parents and 67% of BS parents). Book-sharing is well-known to assist in language development and parent-child interaction (for example, Karrass, J. & Braungart-Rieker, J.M., 2005) but it is likely that trying to use BS whilst book-sharing posed additional problems, especially in relation to attention-directing, and holding the book whilst trying to sign at the same time. Parents in the BS group were proportionately more likely to highlight bath-time, bedtime, or getting ready rather than formal play activities. In terms of overall highlighted instances, the BS group had

proportionately the least number of formal play events in comparison to the other two groups: BS = 6.35; EV = 6.72; and ENV = 7.29. This may suggest issues with object holding and signing for some.

One-way ANOVAs were conducted on the data received. Counts of each type of activity per group were used as the basis for this comparison. There were no significant differences between the intervention groups for the duration of the diary: $F(2, 18) = .48$, $p = .63$, $\eta^2 = .05$; for mealtime play sessions: $F(2, 18) = .29$, $p = .75$, $\eta^2 = .03$; for bathtime play sessions: $F(2, 18) = .17$, $p = .85$, $\eta^2 = .02$; for book-sharing: $F(2, 18) = 1.57$, $p = .24$, $\eta^2 = .17$; for bedtime: $F(2, 18) = 1.61$, $p = .23$, $\eta^2 = .18$; for singing: $F(2, 18) = .06$, $p = .94$, $\eta^2 = .01$; for bubble play: $F(2, 18) = 1.48$, $p = .25$, $\eta^2 = .14$; for household chores: $F(2, 18) = .11$, $p = .89$, $\eta^2 = .01$; for block play: $F(2, 18) = .04$, $p = .96$, $\eta^2 = .005$; for passing games: $F(2, 18) = .92$, $p = .42$, $\eta^2 = .09$; for hiding games: $F(2, 18) = .10$, $p = .91$, $\eta^2 = .01$; for getting ready: $F(2, 18) = .17$, $p = .85$, $\eta^2 = .02$; and for object play: $F(2, 18) = .29$, $p = .75$, $\eta^2 = .03$. These results suggest that the types of games and play were similar across the intervention groups.

Analyses of behavioural (nonverbal) data: Joint Attention (JA), Initiating Joint Attention (IJA), Initiating Behavioural Response (IBR) and Joint Engagement (JE)

It was hypothesized that BS would assist in prolonging JA (both Responding to JA and Initiating JA) and JE over time. Two sets of video recordings were analysed: one set when infants were 12-16 months' old measuring duration of JA and JE, and the other set when the infants had reached 18-22 months measuring frequency of IJA, IBR and

JE. The results for the first set, showing the amount of time infants spent in these states, are shown in Table 18 and 19.

Table 18: Duration of JA (RJA and IJA) and JE at Time Point 1

Group	JA mean no. of seconds	Joint Engagement mean no. of seconds
BS ($N = 16$)	34.29 ($SD = 15.06$; $SE = 3.77$)	32.25 ($SD = 23.72$; $SE = 5.93$)
EV ($N = 14$)	34.83 ($SD = 6.72$; $SE = 1.80$)	24.33 ($SD = 14.74$; $SE = 3.94$)
ENV ($N = 12$)	32.41 ($SD = 11.56$; $SE = 3.34$)	32.36 ($SD = 15.63$; $SE = 4.51$)
Total ($N = 42$)	33.93 ($SD = 11.58$; $SE = 1.79$)	29.64 ($SD = 18.84$; $SE = 2.91$)

Table 18 shows similarity in duration of JA across the groups, although joint engagement appears to be higher in the BS and EV groups at this point. One-way ANOVAs did not show either of these mean differences as significant: $F(2, 39) = 0.83$, $p = .44$, $\eta^2 = 0.04$ for Joint Engagement; and $F(2, 39) = 0.15$, $p = .87$, $\eta^2 = 0.01$ for JA.

To ascertain whether differences might appear amongst the groups at a later stage in the study, joint attention was subdivided and the second set of videos (infant age 18-22 months) was analysed for frequency of RJA, IJA, Initiating Behaviour Response (IBR) and JE. These findings are shown below in Table 19.

Table 19: Mean Frequency of IJA, IBR and JE when Infants 18-22 Months

Group	RJA Mean Frequency (Counts)	IJA Mean Frequency (Counts)	Duration of JA (secs)	IBR Mean Frequency (Counts)	JE Mean Frequency (Counts)	Duration of JE (secs)
BS (*N* = 10)	5.40 (*SD* = 7.41; *SE* = 2.34)	8.50 (*SD* = 6.40; *SE* = 2.02)	207.90 (*SD* = 165.63; *SE* = 52.38)	1.50 (*SD* = 1.90; *SE* = 0.60)	3.10 (*SD* = 4.31; *SE* = 1.36)	290.00 (*SD* = 226.73; *SE* = 71.70)
EV (*N* = 10)	9.40 (*SD* = 16.68; *SE* = 5.28)	8.20 (*SD* = 7.86; *SE* = 2.49)	182.90 (*SD* = 156.57; *SE* = 49.51)	1.60 (*SD* = 2.07; *SE* = 0.65)	5.20 (*SD* = 4.80; *SE* = 1.52)	320.90 (*SD* = 213.12; *SE* = 67.40)
ENV (*N* = 10)	11.40 (*SD* = 11.49; *SE* = 3.63)	9.40 (*SD* = 5.58; *SE* = 1.77)	99.10 (*SD* = 133.50; *SE* = 42.22)	1.80 (*SD* = 2.62; *SE* = 0.83)	3.40 (*SD* = 2.32; *SE* = 0.73)	483.30 (*SD* = 212.54; *SE* = 67.21)
Total (*N* = 30)	8.73 (*SD* = 12.28; *SE* = 2.24)	8.70 (*SD* = 6.47; *SE* = 1.18)	163.30 (*SD* = 154.57; *SE* = 28.22)	1.63 (*SD* = 2.14; *SE* = 0.39)	3.90 (*SD* = 3.93; *SE* = 0.72)	349.73 (*SD* = 219.75; *SE* = 40.12)

One-way ANOVAs showed that there were no significant differences amongst the means for any of the measures: Freq of RJA: $F(2, 27) = 0.60$, $p = .56$, $\eta^2 = 0.04$; Freq of IJA: $F(2, 27) = 0.09$, $p = .92$, $\eta^2 = 0.01$; Freq of IBR: $F(2, 27) = 0.05$, $p = .95$, $\eta^2 = 0.003$; Freq of JE: $F(2, 27) = 0.82$, $p = .45$, $\eta^2 = 0.06$; duration of JA: $F(2, 27) = 1.40$, $p = .27$, $\eta^2 = 0.09$; or for duration of JE: $F(2, 27) = 1.29$, $p = .29$, $\eta^2 = 0.09$. Effect sizes were small showing that there were no significant differences amongst the groups. **Brief summary**: BS did not appear to enhance JA above that of the other intervention groups. It also did not appear to enhance IBR or JE beyond the levels found in these other intervention groups.

Analysis of nonverbal behaviours associated with intersubjectivity and maintenance of interaction

One final area was investigated to measure nonverbal behaviours. This was completed due to the differences in spoken output amongst parents in the intervention groups. Nonverbal behaviours were coded for both parents and infants. Nonverbal gesture consisted of nodding, pointing, clapping, showing, and Baby Signing. Frequency of nonverbal gestures within the 10-minute video clip was coded. The results are shown below in Table 20.

Table 20: Frequency Counts of Parental Nonverbal Behaviours from Videos of Infants 12-16 Months

Type of behaviour/Group	BS ($N = 14$)	EV ($N = 14$)	ENV ($N = 12$)	Total ($N = 40$)
Parental gesture	37.50 ($SD = $ 17.28; $SE = $ 4.62)	16.14 ($SD = $ 7.94; $SE = $ 2.12)	17.42 ($SD = $ 8.93; $SE = $ 2.58)	24.00 ($SD = $ 15.62; $SE = $ 2.47)
Parental pointing	5.93 ($SD = 5.76$; $SE = 1.54$)	4.93 ($SD = $ 5.64; $SE = $ 1.51)	5.50 ($SD = $ 4.74; $SE = $ 1.37)	5.45 ($SD =5.31$; $SE = .84$)
Parental point-directing	3.43 ($SD = 3.16$; $SE = .84$)	2.29 ($SD = $ 2.55; $SE = .68$)	2.75 ($SD = $ 2.99; $SE = .86$)	2.83 ($SD = 2.87$; $SE = .45$)
Parental point-following	2.50 ($SD = 2.93$; $SE = .78$)	2.64 ($SD = $ 3.69; $SE = .99$)	2.75 ($SD = $ 2.18; $SE = .63$)	2.63 ($SD = 2.96$; $SE = .47$)
Parental verbal imitation	0.57 ($SD = 0.94$; $SE = .25$)	1.50 ($SD = $ 2.03; $SE = .54$)	0.58 ($SD = $ 1.16; $SE = .34$)	0.90 ($SD = 1.50$; $SE = .24$)
Parental nonverbal imitation	1.14 ($SD = 1.66$; $SE = .44$)	1.07 ($SD = $ 1.33; $SE = .35$)	1.83 ($SD = $ 2.62; $SE = .76$)	1.33 ($SD = 1.89$; $SE = .30$)
Infant verbal imitation	0.79 ($SD = 1.85$; $SE = .49$)	1.79 ($SD = $ 2.36; $SE = .63$)	1.08 ($SD = $ 1.31; $SE = .38$)	1.23 ($SD = 1.91$; $SE = .30$)
Infant nonverbal imitation	1.93 ($SD = 2.02$; $SE = .54$)	3.64 ($SD = $ 2.31; $SE = .62$)	1.33 ($SD = $ 1.37; $SE = .40$)	2.35 ($SD = 2.15$; $SE = .34$)
Parental attention-getting	13.36 ($SD = $ 11.49; $SE = $ 3.07)	13.29 ($SD = $ 7.61; $SE = $ 2.03)	8.08 ($SD = $ 5.74; $SE = $ 1.66)	11.75 ($SD = $ 8.86; $SE = 1.40$)

Table 20 shows that parents in the EV and ENV groups used gesture to a similar degree of frequency. Unsurprisingly, the frequency was higher in the BS group but the SD was widely-distributed for this group, implying that some parents used it more often than others. Parental pointing was fairly similar across the groups, although parents in the BS group tended to use more points to *direct* attention than in the other two groups. The mean for parents in the EV group showed a higher inclination to imitate verbally, and this inclination appears for EV infants in terms of both verbal and nonverbal imitation. There is a lower mean for parents in the ENV group to use attention-getting techniques than in the other two intervention groups but this may reflect their brief (i.e. to follow the infant's eye gaze, facial expression, overall body language). One-way ANOVAs showed significant mean differences between groups for parental gesture: $F(2, 37) = 13.05$, $p < .001$, $\eta^2 = 0.41$; and child nonverbal imitation: $F(2, 37) = 4.96$, $p = .01$, $\eta^2 = 0.21$. Post hoc tests (Bonferroni) suggested that these significant differences arose between the BS and EV groups ($p < .001$) and the BS and ENV groups ($p = .001$); whereas the differences for child nonverbal imitation arose between the ENV and EV groups ($p = .02$). As the coding time was the same for all the groups (10 minutes) there is no difference in this factor between them.

Means were not significantly different for parental pointing: $F(2, 37) = 0.12$, $p = .89$, $\eta^2 = 0.01$; parental following pointing: $F(2, 37) = 0.02$, $p = .98$, $\eta^2 = 0.001$; parental directing pointing: $F(2, 37) = 0.55$, $p = .58$, $\eta^2 = 0.03$; parental nonverbal imitation: $F(2, 37) = 1.80$, $p = .18$, $\eta^2 = 0.09$; parental verbal imitation: $F(2, 37) = 0.62$, $p = .55$, $\eta^2 = 0.03$; child verbal imitation: $F(2, 37) = 1.00$, $p = .38$, $\eta^2 = 0.05$; or for parental attention-getting: $F(2, 37) = 1.51$, $p = .24$, $\eta^2 = 0.08$. Correlations were found between parental verbal imitation and child nonverbal imitation: $r = 0.42$, $N = 40$, $p = .007$, as well as

between parental nonverbal imitation and child nonverbal imitation: $r = 0.42$, $N = 40$, $p = .008$. Parent attention-getting was correlated with parental gesture: $r = 0.36$, $N = 40$, $p = 0.02$. Both patterns were anticipated. Imitation behaviours are recognised to assist in bonding and intersubjectivity (e.g. Meltzoff & Decety, 2003); and parents would be expected to use pointing, waving, shaking of objects to gain an infant's attention.

Brief summary: parents using BS did not use pointing more than in the other groups therefore this hypothesis was not supported.

7.9 Discussion

Hypothesis 1 suggested that the intervention groups would show a steady improvement across the time-points for socio-emotional development and that scores would be significantly better than for the Non-intervention group. There were no significant differences between any of the groups at baseline but all intervention groups were shown to have made improvements across the timescale whilst the Non-intervention group did not until TP2. Both the BS and ENV groups showed a significant mean score difference from the Non-intervention group at TP1 but only the BS group sustained this result at TP2. This could suggest a socioemotional benefit for BS at the toddler stage, as well as imply a benefit from focusing on nonverbal and gestural behaviours overall.

There were some difficulties in interpreting these results. Whilst there was a suggestion that infants in the BS group would have less frustration in communicating their thoughts and needs, this group had started from a lower mean point score at Baseline (albeit not significantly different) to the other groups, thus rendering it difficult to ascertain whether infants in the BS group were particularly advantaged for socioemotional benefit

246

or if they had reached a particular threshold in socioemotional functioning which enabled them to offset future difficulties. The findings that all the groups (including the Non-intervention group) had benefited by TP2 suggests that all infants had potentially gained a sufficient level of linguistic and/or cognitive resources over time to facilitate the expression of frustrations, fears, and concerns more clearly and in a controlled manner; or that infants had adopted (to a degree) defence mechanisms and strategies to cope with affective difficulties.

Analysis of specific areas of the ASQ: SE showed no significant differences between the groups on individual socio-emotional measures, such as interacting with other people, or self-regulation and compliance. Yet, there is some support for suggesting that BS may assist with aspects of socio-emotional development. Thompson et al. (2007) engaged infants (9-10 months) who became emotionally upset when unable to fulfil certain goals (attention-getting). They found that by teaching infants specific signs the infants initiated goal-fulfilling responses from their parents (e.g. signing 'up'). Vallotton (2008, 2009, 2011) has written extensively on the value of infants using 'signs', intimating that parents and caregivers are more responsive towards them, as well as suggesting that BS facilitates preverbal infant expression of affective states. These findings imply one of two things: either that infants *are* empowered to initiate and fulfil affective goals through BS; or that parental *attitudes* are altered as a result of infants using BS in this way. Larger comparison groups are required to substantiate this but the premise of the current results suggest that the latter is implicated. The significant difference found at TP1 for the ENV group implies a potentially similar effect for both BS and ENV groups but one which is maintained only in the BS group due to parental expectations of an enduring impact.

Parental attitudes

If it is accepted that infants learning BS do have, or are presumed to have, more communicative understanding *by their parents/caregivers*, the implication is that the interaction between them will be viewed as a positive interchange of shared meanings and intent. It is already known that parents of very young babies assume this (e.g. Trevarthen, 1980) and this assists in developing attunement and intersubjectivity. Parents conferring purposiveness to the infant's actions and vocalizations are likely to establish a dialogic pattern of pleasurable activities, thereby maintaining reciprocal motivation and feedback between them both. Moreover, as they are pleasurable they will be invoked on frequent occasions, thereby reinforcing the element of systematicity. In turn, the infant starts to establish a framework of anticipated behaviours, not just in terms of actions on objects or the environment, but in terms of how others will act and react within the exchange. This facilitates two key developments: a gradual recognition of self and other, as well as a foundation to shared meanings and experiences which will be expanded upon with others. The proviso being made here is that there is no clear evidence to suggest that BS is better than other intervention methods at establishing these relationship qualities, *unless* parents sustain that belief.

Góngora and Farkas (2009) have also argued that, when assessed between 12-14 months and 18-20 months, infants and parents given BS training show significantly higher visual and tactile interactions, than a Control group, as well as a trend towards more vocal interactions. There were seven parent-infant dyads in each of their groups. These test periods are similar to the ones used in the study of this thesis. However, an increase in multimodal interaction was not observed in the thesis study over the other

248

intervention methods. By comparing BS with other types of enhanced intervention the division between improved synchrony and intersubjectivity becomes much more ambiguous. If it had been possible to go to the next assessment point (24-30 months), any longer-term benefits might have been ascertained, especially if this reduced the need for MIs. Further investigation of perspective-taking, as well as a specific measure of self-regulation, could tease out any subtle differences showing whether any measurable differences do occur. Equally a longer-term investigation for socioemotional development only could qualify if any potential benefits prevail and if so, why this may occur. **Brief summary**: It is argued here that parental perception of the quality of interactions has most impact on the parent-infant relationship and subsequent socio-emotional development and that this can be enhanced in many different ways. The effect of BS on socioemotional development remains ambiguous until it can be evidenced in larger groups, controlling for the possibility that there may be a threshold minimum score under which particular negative behaviours will not occur regardless of the technique.

Hypothesis 2 suggested that a predicted positive effect in infant confidence-building for BS should be reflected in better overall mean scores for attachment behaviours (as measured by the A Q-Sort). Statistical analyses of the three intervention groups showed no differences in security or dependency attachment behaviours. Thus, this hypothesis was not supported.

Attachment researchers have noted that types of attachment are often reflected in the behaviours exhibited towards primary caregivers (Waters & Deane, 1985). These are pertinent because the nature of the relationship is dynamic, reciprocal, and therefore

249

adapts to the sensitivity of each individual to maintain the interaction (goal-correction) and to absorb any contextual changes.

Coincidentally, there is a core predictability to how parents respond in these situations, therefore infants construct an increasingly complex framework based on their perception of external dangers and their confidence in whether the parent is able to cope with these environmental changes.

Evidence from feral children, children with socio-emotional problems, language impairment or with systemic/pervasive disorders suggests that disruptions to parent-child interactions in infancy can affect an infant's developing linguistic ability as well as relationships (e.g. Chugani et al., 2001; Howe, 2006). Some of these effects may stem from other aspects within the domain-general system (e.g. visuo-spatial cognition (Bates, 2004), some emerge as a result of misinterpretations concerning the infant's capabilities (e.g. Hodes et al., 1999; Howe, 2006). Language delay and/or impairment can lead to assumptions of cognitive or behavioural difficulties which are not present (e.g. Whitehouse et al., 2010). Clearly, attitudes and expectations may play a role in how parent-infant interactions develop.

Recently links between amygdalæ size and linguistic ability have been discovered (Ortiz-Mantilla et al., 2010). This reinforces arguments that language acquisition occurring concurrently with the establishment of attachment patterns and the formation of internal working models (IWMs) can engender problems which will impact on either the linguistic or socio-emotional domain. Schore (2005) as well as Gerhardt (2010) imply that dysfunctions within the prefrontal cortex and right hemisphere may have an

effect on affect, perception and attention, so the infant who is establishing his/her world on sensori-motoric experience may be limited by distortions to the planning, self-regulatory developments which occur at this time. Linking these findings to Tomasello's functionalist approach, it is clear that pattern-finding and intent-reading are difficult to develop under such conditions. Supporting parents to provide the right balance between socio-emotional and linguistic development by helping them to become aware of infant cues, intents, and motivations is particularly important in the prelingual stages.

Infants in the longitudinal study did not fall into 'at-risk' categories, such as those above. Indeed, attachment differences between individuals and between groups were so marginal that any direct comment on attachment effects was impossible. Nevertheless, some socioemotional aspects did become salient. There was evidence of minor language regression during periods of high family stress (reductions in vocabulary). This may support previous literature on the mutual influence of language and socio-emotional development (e.g. Egeland & Farber, 1984) reflecting disequilibrium between affective and cognitive mechanisms during times of trauma[10] (Schore, 2001); or may reflect the parent's own coping with stress at the time. There was also evidence of a mediating effect from siblings at such times. These observations reveal how attachment and socioemotional development, whilst having an overlap, are still quite separate phenomena. Infants can be securely attached but still react to perturbations in their social environment. Investigation of how attachments and socioemotional events may impact on the infant over time is needed.

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[10] The parent may also be distracted during such times from reporting accurately.

Several related studies published in 2000 (e.g. Waters et al.; Weinfield et al.) found that attachments could be secure from infancy to adulthood but that the family environment along with negative life events and circumstances could alter these towards insecure patterns regardless of a secure start. Any future study should investigate whether there are particularly vulnerable ages for such events to have a greater impact; or whether IWM formation, and the quality of mental representation and narratives have a protective effect. A control for temperament should also be added to any future study. Ultimately, this study has shown correlational evidence for links between secure attachment behaviours, infant word production, and syntax, as well as for joint attention and coordinated/supported joint play. Further measures are required to show the correspondence between socio-emotional and linguistic development.

Study weaknesses

Major weaknesses of the study include the lack of attachment behaviour data from the Non-intervention group. This might have helped substantiate whether guided intervention across all of the techniques had had a positive effect on the intersubjective nature of interactions. Moreover, a study of attachment behaviours prior to the teaching of intervention methods could have signalled any potential underlying socio-emotional issues. Employing an Adult Attachment Index (AAI) would have shown any patterns of intergenerational organization of attachment behaviour and interaction; and having an 'at-risk' group as part of the comparison could have highlighted potential areas of conflict overall. There was not enough time to look at changes in attachment behaviour longitudinally, despite having video material which might have signposted emerging differences.

Hypothesis 3 stated that an emphasis on multimodal cues should further enable the BS group to show increased levels of JA, IBR and JE. There were no significant differences amongst the groups therefore this hypothesis was not supported.

Joint attention

As a well-known precursor to language acquisition (e.g. Bakeman & Adamson, 1984; Tomasello & Todd, 1983) JA was a valid measure to use in this study. Tomasello & Farrar (1986) had advocated the use of talk *within* JA formats as particularly beneficial to language learning. Moore et al. (2001) compared three groups: one using BS (symbolic gesturing), one a non-intervention control; and one using verbal labelling. They found that BS helped infants initiate more joint attention episodes, and this was subsequently linked to advanced expressive language skills at 24 months. However, no significant differences were found between the BS infants and the other intervention groups for IJA in this thesis study.

Given Moore et al.'s (2001) results, it is possible that the type of techniques used in this thesis study have all benefited the infants (although see remarks regarding the Non-intervention group above). It is known that IDS uses gesture and prosody to maintain the child's attention and these have both been seen as elements which assist the infant's comprehension (see Schore, 2001). Parents in the ENV group, who were instructed to follow their child's eye gaze and object of interest, similarly supported the joint attention frameworks initiated by their infant. These observations suggest therefore that BS is not necessarily any better at enhancing and establishing good rapport.

In fact, BS has the potential to bequeath a negative effect on joint attention for some hearing dyads. Comparisons with deaf infants of Deaf parents are often invoked to explain why BS should be helpful in terms of JA – but this is disingenuous. Firstly, Deaf parents have to be keenly aware of the visuo-spatial medium and therefore tend to use it more efficiently (see Chapter 2, §2.4.7, p 70 Erting *et al*., 1994 re pointing and Deaf parents). Deaf parents tend to be more tactile as well as gestural. They tend to be aware of the infant's eye gaze. Infants, hearing or deaf, of Deaf parents, synchronise to these orientations, as the context of interpersonal interaction demands it.

However, hearing infants are generally more focused on the auditory and visual channels and therefore may not respond to tactile supports, such as tapping, in terms of communicative intent, especially when this is not a usual constituent of their typical routines. Clibbens et al. (2002), investigating infants with Down's syndrome, reported that the children turned away from interactions where parents attempted to mould their hands into the shapes of signs. They did not appreciate the behaviour as being linked to the exchange. The same authors also noticed that during interactions the focal toy/object/activity often came under the parent's control rather than the child's. This was because the parent wanted to bring the child's attention to a particular item. In other words they were directing attention rather than following it. Parents in the BS group of this thesis study were also found to do more directing than following attention. In terms of motivation to produce words, Harris et al. (1988) showed that infants were most likely to begin with words which were linked to their own actions. BS is not necessarily an easy system to use for gaining attention.

Joint attention is assumed to be fully-established from 12 months (cf. Carpenter et al. (1998) who argued that infants are still distracted by other objects/events before 12-15 months). Later measures used in this current study, when the infants were between 18-22 months, all showed increases in interpersonal nonverbal behaviours. Infants in the BS group appeared to engage in longer periods of JA whilst the ENV group did the same for JE but again none of these differences were statistically significant. Nevertheless, it may be an interesting discrepancy, indicating that the BS infant's underlying play engagement was punctuated more by being aware of parental 'signing'. Ultimately, all three groups continued to remain fairly equitable in terms of these skills. Previous research showing a link between JA and positive affect directed at the interactant (Gaffan et al., 2010) supports the similarity across groups. Most of the infants in the intervention groups had a significant score for secure attachment behaviour and not for dependency, so it was likely that good patterns of JA had been established between the parent and infant at an earlier time.

Initiating joint attention

Similarity across groups was also the outcome for IJA. As this is a skill associated with frontal lobes, there was an anticipated link between attachment behaviours and IJA observation. It would be anticipated that infants showing a more insecure level of attachment behaviour might exhibit fewer episodes of IJA too. This needs further investigation as the intervention groups in the thesis study all exhibited secure attachment behaviours. Mundy et al. (2007) suggest a possible link between IJA and the infant's motivation and reward system. This resonates with research into the PFC and how its development can be affected by socio-emotional instability.

There was an interesting feature in the wider nonverbal codings which suggested that parents in the BS group tended to use pointing to direct the infants' attention more than in the other two groups, although not significantly so. If this trend was used more widely, it could have affected the overall patterns of JA occurring on a daily basis. The data showing parental attention-directing techniques may also indicate a possible level of intersubjectivity in the ENV group which was higher than that in the other two, as the infants appeared to be sharing attention without the need for parents to resort to attention-directing devices. Investigation of whether infants in this group used more tactile or visual interaction would be interesting.

Joint engagement

It was hypothesised that BS would have an increased positive effect on IBR and JE. Again all three intervention groups were of a similar level with no significant differences amongst the means. Thus, this hypothesis was not supported.

IBR is a useful measure to show infant goal-directed behaviour (Seibert et al., 1982). It is evidenced from around 8 months in age (Bakeman & Adamson, 1984) and shows a proto-imperative intent to use the parent as a potential tool to acquire some objective. Joint engagement (JE) in this study encompassed both supported joint engagement (SJE) and coordinated joint engagement (CJE). CJE facilitates measurement of when JA occurs. As it is more complex it tends to appear at a later stage in development (when the infant is capable of attending to and maintaining a joint active interest in an object and person simultaneously). It was decided to keep JE as a measure at the later assessment point to keep continuity with the earlier analyses. Like JA, IBR and JE

reflect developments in social motivation and cognition (although not to the same extent as JA (Mundy et al., 2007). Data implied mean trends towards shorter JE episodes in the EV group than in the other two, with the ENV group spending on average most time within JE. However, these differences were not significant. The implication is that all groups were at similar levels for these developments.

Bakeman and Adamson (1984) analysed different types of infant-parent interaction. They concluded that coordinated joint play culminated from face-to-face play; also that parents, through passive joint engagement[11] facilitated infant development of triadic attention by introducing an object into their joint play so that it appeared to be an animate element within it (for example, by shaking a string of beads, walking a glove puppet/ doll towards them). The researchers suggested that it was not until 18 months of age that infants were routinely capable of coordinated joint engagement, citing Nelson (1979), who argued that infants required integration of their social and physical worlds before they could engage in more complex areas of language development. This might be indicated in developments such as when an infant is able to fuse linguistic and psychological constructs such as 'blue' and 'car' into one concept 'blue car'. Bakeman and Adamson (1984) also highlighted the specific role of the parent in this cognitive advancement by comparing their contribution to that of a peer interactant. They showed that the peer could not provide the consistency of play context or the passive joint engagement support to scaffold the infant's learning. This therefore consolidates the argument contained within this thesis that it is the socially interactive context which

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[11] Passive joint engagement was subsequently called 'supported joint engagement' by Adamson et al. (2004).

fosters the infant's development (see Chapter 1, §1.8; Chapter 3, §3.2; Chapter 5, p 117; Chapter 7, pp 173).

There is debate regarding the relative roles of SJE and CJE in the language acquisition process. Adamson et al. (2004) argue that SJE may be more important due to the scaffolding role of the parent. This means that the parent can choose the context and pace for introducing symbols to the child. This takes the burden away from the child to maintain the interaction per se and facilitates their fullest attention on the activity/object at hand. Moreover, Adamson et al. (2004) continue that the infant is unlikely to have the skills to organize and connect conversational strands before the age of 30 months.

7.10 Conclusion

There is evidence for socio-emotional benefits stemming from all interventions used in this study, with BS potentially sustaining benefit over a longer time. The mechanisms underpinning this are, however, unclear as it may be parental perceptions which are driving the effect. The finding of a significant difference between the ENV and Non-intervention groups at TP1 imply that given appropriate support to develop quality play and nonverbal techniques, parents may be able to sustain enhanced socio-emotional quality. Further inquiry is needed. It is purported here that parents should be encouraged to establish intersubjective, synchronous play patterns with their infant rather than persuaded to adopt practices which focus predominantly on labelling at ages as early as 6 months. In fact, Goodwyn and Acredolo (1993) themselves state that symbolic gesturing is facilitated by cognitive skills already being in place. The commercial trend

to push BS at ever-younger children ignores the fact that the quality of interpersonal socio-emotional interaction needs to be fostered first.

Previous research suggests that infants benefit from improved intersubjectivity. Parents can provide appropriate scaffolding to assist in the co-construction of meanings in situ. In terms of language, when comparing the top 4 performers in each of the intervention groups, there were no significant differences between them in terms of words produced or complexity. This suggests that all of the interventions were beneficial. What is of note is that IJA and AQ-Sort scores were correlated. This again highlights the importance of positive relationships in early infancy, cognitively, linguistically, and socio-emotionally. Promoting healthy intersubjectivity, along with clear preverbal behaviours (especially joint attention, and gestural activity) are key to establishing a long-term successful interactive relationship. However, in modern life, with its many pressures, it is becoming increasingly difficult to do so. As researchers it is important to highlight the importance of traditional practices, such as play, regardless of the technique employed.

In the final chapters, the focus moves away from BS and other intervention techniques to look at how parent-child interactions are affected when interrupted by dysfunctions such as chronic illness, especially those which affect communication. In particular, the impact of otitis media with effusion (OME) is considered as the pathology does not have a consistent presentation, affecting children binaurally, monaurally, in short durations, or in longer episodes. Above all, the condition is asymptomatic and can therefore be overlooked at times when language and interaction patterns are developing. Previous chapters in this thesis have described the links between preverbal behaviours,

language acquisition, and socio-emotional development. If any of these are disrupted the potential for disturbance in the other areas is increased. Chapter 8 defines OME before moving onto the experimental investigations that were undertaken to research the condition further.

Chapter 8: The Effects of Otitis Media with Effusion on Parent-Child Interaction

8.1 Introduction

Many different medical conditions have a detrimental effect on infant language acquisition and socio-emotional development. These range from pervasive states, such as Down syndrome, autistic spectrum disorders, Landau-Kleffner syndrome, central processing disorder, and attention deficit disorder, to diseases which are viewed as common and 'relatively mild' like otitis media (e.g. Rosenfeld & Bluestone, 2003). Despite this low-key label, otitis media is a condition highly prevalent amongst pre-school children (affecting up to 80% of preschoolers at some time (Kubba et al., 2000), spanning from mild acute otitis media (AOM) to otitis media with effusion (OME). Zielhuis et al. (1990) found that season and gender (winter and male) are significant factors affecting the child's proclivity to develop the disease. Ultimately, persistence as well as degree of severity and whether the condition affects the child mon- or binaurally are important factors in addressing the child's needs (e.g. Marev, 2004). Fluctuations and asymptomatology in OME render the condition particularly problematic to study.

8.2 A definition of OME

The otitis media spectrum is used to describe both acute and chronic middle ear inflammation, with chronicity often identified in cases where problems persist for a period of at least three months (Maw, 2002). OME is known by various terms, including secretory otitis media, non-suppurative otitis media, and glue ear (ibid, 2002). It includes an element of fluid effusion which can fill the middle ear cleft, affecting the conduction of sound, and thereby hearing acuity. The consistency of the fluid can vary

and this has a bearing on the level of deafness experienced. Importantly, the fluid is frequently undetected (Natal & Dyne, 2011) as there is rarely the expression of a concomitant feature, such as earache, fever, or a bulging/opaque tympanic membrane (SIGN, 2003, although note that AOM can occur prior to OME, when such symptoms may be exhibited – e.g. Haggard et al., 2003). This means that the condition may self-resolve before any long-term psychological and/or socio-emotional consequences of the disease are specifically linked to it. Natal and Dyne (2011) state that it is important to distinguish between AOM and OME, not least in order to respond most effectively in terms of treatment (especially the appropriate administration of antibiotics) but also to minimise potential sequelae[12].

OME has a widespread epidemiology (affecting around 80% of children at some point during their preschool years – Kubba et al., 2000). This makes it the most prevalent reason for deafness in children within developed nations (Gibbin 1993; Kubba et al., 2000). Children with OME can suffer from a mild to moderate degree of hearing loss, with an average of 27 decibels (Lim, 2002), but some children suffer from as much as a 50 dB hearing acuity (Hogan et al., 1997). Williamson (2007) stated that a hearing loss of 15 decibels may be detrimental to children. This is due to their linguistic skills still developing. Environmental hazards, such as speakers using a quiet voice, especially in situations when speech signal to noise ratios favour background sound (traffic, TV/radio, household appliances, or in shops (see e.g. Bamford & Saunders, 1985)) dissipate the communicative message. This is easily illustrated for adults in noisy environments who have to reconstruct what is said to them with variable levels of

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[12] SIGN (Scottish Inter-Collegiate Guidelines Network) 2003 suggests that distinguishing between AOM and OME in children is difficult unless both a high level of training and specific equipment is available. This is not always the case.

success (in a restaurant or bar is a typical example). Adults obviously have more linguistic and contextual experience to undertake these reconstructions than children.

OME differs from AOM due to this asymptomatic expression. It makes diagnosis difficult (Hogan et al., 1997; Simpson et al., 2007). With AOM the infant/child is more likely to suffer from earache or run a high temperature, more likely to tug or rub at the affected area and also experience a cough or runny nose before the onset. None of these symptoms are predictors of OME. Enlarged adenoids can be part of the pathology but not necessarily so. OME may affect both ears simultaneously, at different times, or monaurally only; may appear in successive bursts, or persist over a longer duration. In sum, OME is not only difficult to diagnose, but is also difficult to treat and predict its longer-term effects.

8.3 When might OME occur and how might it affect the child's development?

Rosenfeld and Bluestone (2003) state that AOM is most common between the ages of 1-3 and OME between 2-7 years of age (although compare to Wilks et al., 2000, who suggest that OME is most prevalent between 2-4 years). Gibbin (1994) wrote that the majority of OME cases is seen between 2-3 years. This reinforces the need for research at this age; when infants' language skills are still developing and becoming more complex (two-word stage onwards). Previous studies claiming to show OME's detrimental effect on language development, behaviour, working memory, phonetic perception, attention, and social skills (such as Feldman et al., 1999; Sylva et al., 1986; Polka & Rvachew, 2005; Feagans et al., 1994; Nittrouer & Burton, 2005; and Gouma et

al., 2011), whilst criticised, still merit further investigation. Some of these themes are addressed in more detail below.

8.4 An overview of existing literature

Before highlighting specific studies in more detail, it is important to point out that many previous investigations have tended to target language and speech development (e.g. Vernon-Feagans & Manlove, 2005; Winskel, 2006; and Vernon-Feagans et al., 2007) and have looked at the *complete* spectrum of otitis media (OM) conditions. Fewer studies have focused on psychosocial development and behaviour, across the OM spectrum or targeted OME in particular (Bennett & Haggard, 1999). In addition, whilst the effects of AOM appear not to lead to any long-term disadvantages (linguistic or psychosocial), there is controversy regarding the impact of OME (Bennett et al., 2001; Marev, 2004) which appears to have arisen due to methodological issues. Many studies have lacked the statistical power to show up small effects, particularly crucial given the variable nature of OME (Bennett & Haggard, 1999). Children with additional conditions, such as Down syndrome or cleft palate, have been included, thereby ambiguating data interpretation (Rovers, 2008).

Criticisms have been made of small studies (many of which were case-controlled) for their inability to adequately control confounding variables (Bennett & Haggard, 1999); such as parental smoking, SES, gender, nursery provision, seasonal variation, multiple siblings, and propensity to infection (Kubba et al., 2000; Williamson, 2007). However, the use of population-based studies - which have insufficient numbers to highlight more extreme cases - has fared no better (Bennett et al., 2001). Finally, the inability to

distinguish between typical behavioural and communication difficulties and those directly attributable to OME, especially during preschool years, has led to a higher number of studies being retrospective in nature (Wilks et al., 2000; and see also Chapter 3 on IWMs, synchrony and attachment). These approaches lose the dynamic interaction and richness of data which may pinpoint specific effects at the crucial time. Clearly, in any attempt to identify potential socio-emotional differences between children with OME and controls, it is important to be aware of these issues.

8.4.1 Studies of language and OME

Haggard and Hughes (1993) highlighted the problems in analysing language studies due to the inherent difficulty in pinpointing *how* OME may create, *specific* linguistic constraints on syntax, lexicon, pragmatics, or phonology. Haggard and Hughes (1993), also noted that two large investigations (the Dunedin Study (1989) and the Boston Study (1990) found equivalent deficits, not only in linguistic areas, but also in motor skills and nonverbal IQ). These would be harder to attribute to middle ear dysfunction alone (although interestingly they may relate to issues of writing difficulty found in Hall et al.'s 2009 study).

Additionally, these larger longitudinal studies (such as the 1970 British birth cohort, and the Dunedin Multidisciplinary Health and Development Study), whilst providing some data on OM, were actually designed to pick up on multiple factors rather than on OM specifically. This meant that aspects such as binaurality, severity and duration of otitis media were not necessarily recorded, or at each stage. Detailed information regarding

these aspects is necessary to evaluate their relative impact on language development and behaviour. All of these issues render interpretation of data fraught with difficulty.

8.4.2 Specific language areas

The nature of how OME might potentially be detrimental to *early* language and socio-emotional development has not been as fully investigated as studies involving older age groups. Three studies which have looked at early language acquisition are explored in more detail below: these relate to developments at different tiers of comprehension and perception.

Polka and Rvachew (2005) investigated linguistic development at the phonetic discrimination level. They tested infants between the ages of 6-9 months on their phonetic perception, specifically on their ability to perceive a change between the syllables /bu/ and /gu/ when exposed to a continuous stream. These syllables involve plosive and velar components respectively which differ in terms of voice onset times (VOT) as well as place of articulation. Infants were deemed to have perceived the change between them if they turned their head towards a visual reinforcer when the change occurred. The syllables were played to the infants at the level of a slightly-raised (72 dB) but typical conversational voice. The researchers had three groups: infants with no history of OME, infants with history of OME; and infants with current OME. Their findings showed that both groups of infants with some experience of OME performed worse on phonetic perception than the history-free group.

Whilst there is a limit to the duration of effect addressed here (a period of three months) the finding is nevertheless important, especially when related to Bennett et al.'s (2001) result that reading difficulties in children with a history of OME may be related to phonological coding problems in short-term memory. VOT is a common discriminatory feature in speech comprehension (e.g. Bamford & Saunders, 1985), and this is easily illustrated when considering the potential ambiguities that arise with words such as 'bought', 'pot', 'got', and 'caught'. Context, a clear speech signal, eye gaze, and timing all assist in discrimination: experience, a comprehensive linguistic store, and predictability enhance whether the appropriate option is selected. This process is obviously less well-developed in infants and young children, especially those with middle ear dysfunction.

In a separate study, Feldman et al., (1999) investigated the impact of the persistence of OME during the first two years of life on the infant's general language and communication development. They used the parental-report MCDI (both levels) to measure this. By using a parent-report format, the researchers were able to obtain a more representative sample of infants' language development over the period of the study. Their findings suggested that there was a negative correlation between the later MCDI (Words and Sentences) and the number of days when OME was present but that these correlations were small (< 0.09). However, they adjusted these correlations for SES and found that all correlations disappeared apart from those for vocabulary production. They also found that OME accounted for very little of the variance in this remaining significance, implying that OME may not have been the main contributory factor.

267

The inability of some studies to partial out confounds has led various researchers to argue that it is social deprivation rather than OME per se which is the real link to depressed attainments, especially as low birth weights and prematurity (both associated with the occurrence of OM) are more prevalent in socially-disadvantaged sections of the population.

There were, however, other limitations to the Feldman et al. (1999) study. The smallness of the effect obtained may have resulted from the limited age range employed. Teele et al. (1984) had posited that the duration of OME in the first year of life correlated most clearly with language in the child's *third* year. By prematurely stopping the research at two years of age, the actual strength of effect may have been missed. Feldman et al. (1999) had also estimated the duration of OME, basing their decisions on how the disease presented at monthly appointments. If the infant presented in two consecutive monthly appointments as OME-free, there was an assumption that there had been no other episodes between these time-points. Although OME episodes typically last for approximately one month (Polka & Rvachew, 2005), this is only an estimate. However, Feldman et al.'s (1999) own concern, that using MCDIs for more complex linguistic features (especially at the Words and Sentences level), might risk parental omissions of more subtle changes and developments, is likely to be unfounded as the MCDI has correlated strongly with results from more formal assessments when used concurrently (Feldman et al., 2005).

In 2005, Nittrouer and Burton came back to the issue of low-SES and combined their investigation with a focus on the acquisition of attentional (weighting) strategies when acquiring a first language. They argued that it is this skill which enables a speaker to

focus on the key aspects of a communication signal, facilitating an ability to parse the speech flow into meaningful units. Crucially, these optimising strategies differ according to the properties of individual languages so experience and unimpeded exposure are important. This emphasises the *role of interaction* in the language acquisition process.

They compared 5-year old children with a history of OME (but who were at that time free from the condition) to three other groups (children from a low-SES background, children with both a history of OME *and* low-SES status, and a control group). They employed eight measures (two on speech perception; three on phonological awareness; one on verbal working memory; one on sentence comprehension; and one for temporal-processing. Whilst their results showed a similarity across all the experimental groups, there were two notable differences. Children with OME differed from the control group for verbal working memory and sentence processing. Such findings imply an impact for OME which exists beyond that of low-SES (although it might also be argued that a dual impact of low-SES and OME should lead to a compounding effect over and above the other experimental groups). Another interpretation, however, is that low-SES and/or OME has a similar effect on the *interactions* which occur between parent and child. This interpretation would fit with Tomasello's theory of functionalism (cf. Chapter 1, §1.10, p 41); and provide support for the value of the SAM model (cf. Chapter 1, §1.9.1, p 38) and Bruner's emphasis on parental scaffolding (cf. Chapter 1, §1.8.2, p 34). Do interactions in situations of OME become sub-optimal, altering in some way? What evidence is there for potential impact on the precursors of verbal language, and the socio-emotional, interpersonal domain?

8.4.3 Previous studies of OME and socio-emotional development

The most recent study to focus on non-linguistic correlates and OME is that by Gouma et al. (2011). They recruited children between 6-8 years of age, dividing them into two groups: one consisting of children with a history of OME at the age of 4-5 years; the other a control group of participants with no history of hearing loss. No child who had had a bout of OME within the last 6 weeks was included in their testing; and all children were from a mid-SES background.

Using an internationally-standardized test (the Child Behaviour Checklist questionnaire), they found that children in the experimental group exhibited higher levels of hyperactivity, attention difficulties, as well as problems of anxiety and depression than the controls. There may be queries regarding the criteria for allocating participants (as OME is asymptomatic there may have been children in the Control group who had had the condition); however, the higher proportion of psychosocial problems in the experimental group is not unique. More generally, Maw et al. (1999) as well as Wilks et al. (2000), using the Richman Behaviour Checklist, found a general measure of behaviour difficulty amongst pre-school children with recurrent OME. Regardless of whether such behaviours are difficult to differentiate from typical preschooler behaviour, there is a theoretical and clinical impetus to investigate these areas more fully, and at an earlier age before such modus operandi for interaction becomes too embedded. At any rate, these findings resonate with those of Carson et al. (1998); and Redmond and Rice (1998) (see p 305).

Welch and Dawes (2007) specifically looked at the possible relationship between variability in hearing loss (though not targeted just at OME cases) and behaviour. Again, participants came from the Dunedin longitudinal study and two separate behaviour scales were used: the Rutter Behaviour Questionnaire, given to parents and teachers when children were 5, 7, 9, and 11 years old; and the Revised Problem Behaviour Checklist, given to parents only, at 13 and 15 years. The first of these assessments addressed behavioural areas of hyperactivity, neuroticism, and antisocial behaviour; the latter expanded on this, looking at socialized aggression, inattention, hyperactivity, anxiety, and psychotic behaviour. They found that where hearing loss was a factor, girls' behaviour in particular worsened. Other researchers, such as Bennett et al. (2001), who did target participants with OME, indicated additional adverse outcomes, including inattention, hyperactivity, and impoverished reading ability up to 18 years in age.

All of these results support the need to investigate OME in more depth, partly due to its prevalence but mainly due to the range of potential detrimental sequelae. Attention difficulties in particular appear prominently. This may link with socio-emotional development (see Chapter 7). Designing interventions which might assist parents, especially when children are still in their preschool years and OME is at its most prevalent, could minimise longer-term effects. Rosenfeld et al. (1997), and Timmermann et al. (2000) each highlighted the difficulty of parents identifying emotional distress in their child suffering from OM, making them more likely to refer to medical professionals where there was an *obvious* problem in speech or language, or if the child seemed to be in physical pain. This may occur much later when various negative coping strategies have emerged. An understanding of how distress or difficulty

might be indicated in nonverbal interactions could be beneficial both in the short- and long-term to the parent and child. As Wilks et al. (2000) point out; maladaptive behaviour which is in situ for some time may have a negative effect on the parent-child relationship.

8.4.4 Why parental and family support are important for children with OME

Given the paucity of external symptoms, information and support are particularly useful, not only in terms of minimising the detrimental effects of the condition on the child but also in minimising the impact on the family as a whole. OME's erratic and dynamic pattern, described above, makes predictability and consistency in behaviour difficult. There is a dearth of research into the types of intervention technique which might assist communication and interrelationships in these early days. Until the 1980s, typical treatment for severe or recurrent cases of OME was to intervene surgically. However, more recently, 'watchful waiting' for a minimum of three months has been employed (e.g. Hall et al., 2009), and efforts have been focused on measuring patients' life quality when deciding on appropriate health intervention strategies. Communication strategies which parents could employ during these 'watchful waiting' periods may be beneficial long-term, especially in terms of preventing negative cycles of behaviour, attention, and social development. A tendency towards investigation of socio-emotional and behavioural effects on a retrospective basis does not assist parents in 'real time'.

Yet, this is often the case. Larger cohorts, such as Bennett et al. (2001), based their analyses on the children with recurrent OME in the Dunedin longitudinal study. They found that these children had problems with inattention until 15 years, and lower IQ

until 13 years, even *after* controlling for the confounds of SES, gender, and maternal malaise. Hall et al. (2009) investigated whether early or delayed surgery had an effect on educational achievement for OME sufferers. Their findings showed that teachers assessing children's language and writing skills, as well as their emotional resilience, indicated improvements when early surgery had occurred. They had used adjusted analyses to account for the covariables of age, gender, housing, maternal education, and parity amongst mothers across the groups studied. Wilks et al. (2000), whilst not controlling for other factors (it was a fully randomised study), observed that behavioural difficulties were noted in 55% of preschool children who had experienced OME for a minimum three-month period. There are, of course, other studies which have suggested that there are no long-term effects from OME (e.g. Paradise et al., 2000; Maruthy & Mannarukrishnaiah, 2008) but again methodological issues impel further investigation of the issue, and demand a new perspective: looking at the *actual* interactions which occur between parent and child *as they unfold*.

8.4.5 The importance of the quality of interaction

Unfortunately, rather than focus on providing parents with tools to improve the interactions, emphasis has been placed on external mediators. Researchers cite that the mitigation of good quality child care offsets any long-term effects of OM/OME difficulties (e.g. Vernon-Feagans et al., 2007; Vernon-Feagans & Manlove, 2005; Sonnenschein & Cascella, 2004; and Freeark et al., 1992). Sonnenschein & Cascella (2004) reported that paediatricians, whilst agreeing OM pre-two years in age had an effect on the child's linguistic development, also opined that positive parenting and nursery care could offset these effects. This meant that they did not automatically refer

273

children for audiological testing and that they were less aware of or concerned by any other socio-emotional effects. The problem with such assumptions is that they imply that positive interventions are available to all children. They are not; and positive parenting at times requires intervention to assist parents in the execution of their role.

This situation, where clinicians take a cautious approach is understandable but shows the need for other appropriate bodies to provide a research platform. Rovers (2008) wrote that the estimated annual cost of treating OM (AOM and OME) in the USA alone was $3-5 billion: a figure most likely to be an underestimate. As OME tends to be asymptomatic and self-resolves, universal screening for it is also often viewed as uneconomical (Simpson et al., 2007). Yet, the onus should not be on clinical services alone to provide the basis for investigating how parent-child interactions could be supported. By placing the emphasis on speech and language development, or on psychosocial dysfunction, the *interpersonal perspective* to these areas has been diminished. Basing newer studies on the longitudinal cohorts of the Dunedin study and the British Birth cohort leads to an interdependence of samples, and dependence upon the accuracy of the original data and collection methods. They continue to be retrospective. There is a need for research based on real interactions between parent and child that are current and dynamic. Whilst there are some studies which have investigated the possible effects of the entire OM spectrum on such interactions, the aim of the current study, undertaken as part of this thesis, is to take these findings further and relate them to OME in particular.

8.4.6 Previous studies of how OM affects the interpersonal communication between parent and child

Yont et al. (2001) investigated 12-month old infants' communicative intents with their parents during a play session. They measured these intents via the Inventory of Communicative Acts – Abridged (INCA-A). This divided the data according to the social context, and the speech act involved. Intents included verbal/nonverbal intention to make a statement, to initiate/follow/sustain joint attention, or to make a request. The researchers had two groups: one comprising infants with chronic OM, the other with no history of OM. Triads (mother-father-child) were filmed playing for 20-minutes within the home. Age-appropriate toys were provided. All of these participants were from a mid-SES background.

The researchers found much individual variability *within* groups therefore specific differences were potentially obscured. There was a trend for infants with chronic OM to produce fewer communicative intents than the control group. These infants were also less flexible in utilising communication pragmatically, tending to rely on well-practised routines. Fewer children with OM directed their parents' attention or engaged in joint discussions, and the control group engaged in object transfer (showing, holding out and giving objects) three times more than the experimental group.

The age at which all of these infants were tested led to a lack of clear data. At twelve-months infants are just beginning to use their first words and therefore much of their verbal output (for both groups) was classified as unintelligible. However, their research can be extended and made more focused by analysing the interactions between parents and children 18-24 months (as well as those 24-36 months) in age as the interactions

should be much richer, and therefore facilitate the discrimination of any patterns of potential differences which might be occurring. The older age range also enables the targeting of OME specifically, as it is more common between the ages of 2-3 years, and the history of the condition (chronicity, mon- versus binaurality, severity) should provide a platform for better group allocation.

Alternatively, investigating the parents' behaviours during interactions could also illuminate whether there are distortions occurring here. Yont et al. did exactly this in a follow up study in 2003. They had two comparison groups: one of infants who had experienced infrequent bouts of OM, the other had had experienced frequent episodes. Again triads (mother-father-child) were filmed for 20-minutes playing within the home, and age-appropriate toys were provided. All of these participants were from a mid-SES background. The authors found that parents of infants more severely-affected with OM tended to direct their child's attention more and engaged in fewer joint attention episodes. This was particularly marked amongst fathers. As in the first study, the number of infants involved was small (40 infants in total for the 2001 study; 48 for the one in 2003). The researchers had an equal number of males and females involved but, as has been shown previously, males are particularly vulnerable to OME (cf. p 106), therefore subsequent studies, controlling for severity, chronicity, and aurality might be more effective if this gender grouping is targeted, especially when evidence also suggests that males use less gestural communication, and tend to be slower in language acquisition (Özçalışkan and Goldin-Meadow, 2010).

In summary, these studies show how OM affects both the parent and the child's communicative behaviours, disrupting the normal patterns of parent-infant interactions.

This makes predictability and synchrony problematic and in turn leads to the establishment of negative interaction strategies. It is, as yet, unclear how OME specifically might affect them. This thesis throughout has emphasised the importance of successful interactions for the child's language and socio-emotional development. Thus, notwithstanding the methodological weaknesses highlighted above, OME appears to be a serious problem, especially in young children whose language and social experience are relatively immature, rendering awareness of the potential difficulties they may face relatively obscured. There may be added potential for parents to blame the child's temperament for behavioural problems rather than the underlying clinical condition. The situation is further ambiguated due to the standpoint of interested professionals. Given that watchful waiting is regularly employed at the clinical stage, giving parents an awareness of what may be involved in their child's condition is crucial; firstly in terms of approaching their GP for an initial referral at the primary level; and secondly by giving them appropriate skills to ameliorate their interactions. The commonality and 'mildness' of OME should not lead to superficial assumptions regarding long-term effects.

Moreover, given the significance of socio-emotional development in the first two to three years of life (Schore, 2003; Gerhardt, 2010), at a time when the infant is unable to indicate a hearing problem and when intersubjectivity and attunement are so essential, investigating potential difficulties may assist in better interventions and standards of care. Joint attention and coordinated joint engagement lend themselves to comparison with control groups. In addition, by investigating parental *perceptions* of the effects of the condition on *their* own quality of life as well as their perceptions of their child's social-emotional behaviour, it might be possible to gain a more accurate account of how

families cope with the condition on a day-to-day basis. These are the aims of the current study.

8.5 Rationale for the current study

The commonest Ear, Nose and Throat (ENT) disorders amongst children are glue ear (otitis media with effusion), earache (often symptomatic of acute otitis media (AOM)), and obstructed breathing (sleep apnoea). In chronic and persistent cases of any illness it is reasonable to assume that there is an impact on overall *family* life. However, the silent nature of OME implies that the impact of this condition could be particularly severe. Persistent ambiguity of results when analysing the effects of OME has previously related predominantly to the child's linguistic, educational and/or psychosocial development. Little attention has been given to the impact on the interpersonal and interactive elements of communication between parent and child. Of those studies which do exist, most refer to the entire OM spectrum.

This study aimed at investigating this issue more fully. Participants were recruited from these common ENT groups for comparison. They had all received a clinical diagnosis for their condition and had presented with it for a period of at least three months, thereby fulfilling the requirements of chronicity and severity. Participants were between the ages of 17-47 months which allowed observation of richer verbal and nonverbal interactions during play. Few studies have looked at the specific mechanisms of nonverbal communication in this context.

The links between poor communication, language, and socio-emotional development have already been alluded to in this thesis (Chapter 3), therefore, if data point towards the need for appropriate intervention to assist in communication and in the identification of children at risk of longer-term difficulties, such a study of the impact of OME on interaction is important. It was hypothesised that children with a history of OME would show a higher level of socio-emotional need, less linguistic dexterity and have a greater impact on the family as a whole. Ultimately, if this were the case, it was hoped that results could lead to future guidelines to ameliorate the quality of interactions that may take place (e.g. better use of nonverbal cues, such as pointing).

There were three main aims involved in this study:

1. To investigate parental perceptions of their child's socio-emotional development via the ASQ: SE questionnaire.
2. To investigate the actual nonverbal behaviours of preschool children specifically diagnosed with OME.
3. To investigate the impact of chronic OME on family life as measured by a parental quality of life questionnaire.

It was hypothesised that

- Parents of children with chronic OME would show more socio-emotional concern for their child than parents of children in the other groups.
- Chronic OME would have an effect on the child's pragmatic and nonverbal communication skills.

279

- Chronic OME would have a greater impact on family life than other ENT conditions, such as throat problems.

To investigate the issues of socio-emotional development and impact on family life, children with chronic OME were compared to two other groups: a younger non-ENT control group, and a group of preschoolers who had been referred to ENT with other issues. In this way it was possible to investigate the specific impact of OME against a developmentally younger group of children and a group which had a chronic ENT history but not one which did not involve communication problems. Parental perceptions of the effects of the condition on their own quality of life as well as their perceptions of their child's social-emotional behaviour provided the opportunity to gain a more accurate account of how the family coped with chronic OME on a day-to-day basis. Quality of Life (QoL) surveys enable insight into non-clinical issues affecting the family which may help to target appropriate intervention. Parents of children with OM have been found to view their child's life quality on a par with those suffering from other chronic conditions, such as asthma. By using such a device the aim was to discover the nature of parental concerns, especially with regard to socio-emotional issues.

To distinguish between types of OM, children were allocated to groups according to whether there was a current effusive element, and if this had also been present at some point during the previous six months. As AOM and OME are part of the same spectrum, it is feasible that infants with more persistent AOM could develop middle ear effusions at a later date. However, by choosing participants for the ENT non-effusion group who

had not shown any signs of effusion over the previous six months (taking season into account) it was possible to discriminate clearly between cases.

AOM does have one potential problem in that researchers find that there is no agreed universal term for it (SIGN, 2003), despite it being a fairly common condition (a statistic from the Royal College of General Practitioners, 1986 showed that the overall episode rate was 27.6 per 1000). Nevertheless in the UK, NICE (National Institute for Clinical Excellence) recommends clinical referral if a child has more than four episodes of AOM in a six month period or experiences complications such as febrile convulsions and a high temperature (NICE, 2001). Monobe et al., 2003, found that AOM was increasing, with possible causes cited as a decrease in breastfeeding, an increase in antibiotic resistance (the common treatment for AOM) and an increase in group nursing. They concluded that there was an increased risk of recurrent AOM in infants below the age of 2 years. This all suggested that there would be a reasonable pool of potential participants with AOM symptoms. Moreover, as clinical tests included an element of tympanometry, it was also known whether an effusive component to the aetiology had been recorded over the 6 month period.

Alongside AOM patients, infants with enlarged adenoids or inflamed tonsils were also included. Adenoids have been implicated in the pathogenesis of OME but evidence is so far inconclusive (Gibbin, 1993). Infant patients with this type of problem are particularly interesting as adenoids tend to reach their peak size at four years of age (Gibbin, 1993). This suggested that infants with enlargement at an earlier age could present a further useful comparison, bolstering the number of participants with AOM. Some children with enlarged adenoids and/or tonsils are affected by sleep apnoea.

Again, the aetiology of this condition can be multi-faceted, (including increased susceptibility due to prematurity) but due to its increased association with Sudden Infant Death Syndrome, and its prevalence between 3-6 years, this is a demographic frequently referred to consultant care. Care was taken once more to ensure that there was no effusive component involved in the aetiology of individuals with sleep apnoea ascribed to this group.

8.6 Methodology

Design

This was a between-group cross-sectional design. The presence of middle ear effusion, (mono or bilateral) as indicated in the child's existing ENT data, was used to allocate participants to the appropriate group.

Participants

A total of 29 children were recruited from the clinic lists of two consultant ENT specialists over a period of 5 months. This number included children who were under review (13) as well as new referrals (16). Ten children were recruited from Yorkhill Children's Hospital, Glasgow, between December and January 2009/10. A further nineteen participants were subsequently recruited from Sunderland Royal Hospital between Jul-Sept 2010. Thirteen non-ENT participants were recruited from the on-going longitudinal study described earlier in this thesis. Five ENT participants were subsequently excluded from analyses due to additional health conditions that may have influenced the parental ratings (3 from Group 1 (3 reviews), and 1 from Group 2 (a new referral)). This meant that the final numbers in each group were as follows: Group 1

(OME): $N = 14$, Group 2 (ENT w/o effusion): $N=11$; and Group 3 (non-ENT): $N = 13$.

Participants' ages ranged from 17 – 47 months, with a mean age of 31.00 for Group 1

($SD = 9.17$, $SE = 2.45$); 30.73 for Group 2 ($SD = 10.06$, $SE = 3.03$); and 23.08 for

Group 3 ($SD = 5.78$, $SE = 1.60$); total mean =28.21, $SD = 9.05$, $SE = 1.47$ ($N = 38$).

Group allocation was made on the basis of the presence of an effusive component to

ENT condition over a 3-6 month period. This is in line with the characterization of

OME as having a middle ear effusion present for 3 months or more (Kubba et al., 2000).

There was an even division of gender in Groups 1 and 2, with Group 3 having one

additional male. Participation was completely voluntary and parents were aware that

they could withdraw at any point during the proceedings.

Procedure

The ENT consultants involved identified specific paediatric clinics where appropriate

potential recruits were expected to attend. The researcher approached these before their

clinical appointments to explain verbally the nature of the study and made clear that

participation was voluntary. Relevant written details were left for parents to study in

more detail before deciding on consent (Appendix 13). These materials were assessed

for readability, using a software readability program.

If parents gave consent, they were asked to complete two questionnaires: the PAR-ENT

QoL and the ASQ: SE respectively. It was made clear that they could ask further

questions for clarification at any point. Both questionnaires required a tick-box

response. The PAR-ENT questionnaire consisted of 18 items with answers chosen for

each from 5 possible options. The ASQ: SE had 30 questions with responses relating to 3 possible options.

At this point, the researcher asked the parent and child to decant to another room where their play was videoed. In both hospitals a separate clinic room had been allocated for this purpose. Group 3 children were videoed in their own home. Play materials consisted of a farm, complemented with tractor, people and animals; and a spaceship with moon buggy, astronauts and space dog. These were placed on a table, with chairs for parent and child facing a camera situated 2m from the table - unintrusive but close enough to decipher dialogue or facial expressions when coding.

The researcher ensured that participants were within camera shot and instructed the parent to use the play materials in any way they so wished. Once the camera was recording, the experimenter left the room for 8-10 minutes to facilitate less inhibition amongst the children involved.

At the end of the recording, the researcher informed participants that their involvement in the study was complete and asked if there were any further questions or concerns. The researcher also indicated that there would be no further contact from her but that if the participants were interested in the results these would be available via the consultant concerned. The individual child's ENT records were accessed by the researcher to ensure appropriate group allocation and where participants were new referrals, the researcher referred back to the consultant for clarification.

As in the longitudinal study, video clips were analysed for nonverbal behaviours, again using NVivo. The clips were 8-minutes long. The researcher also transcribed some (69%) of the verbal dialogues but as time was short was unable to do so for all. Consequently, there is no analysis of child verbal language in this study.

8.7 Ethical considerations – see Chapter 5

Materials

A licensed copy of the PAR-ENT Quality of Life questionnaire (PAR-ENT QoL), translated into English, was used along with the age-appropriate questionnaire from the Ages and Stages Questionnaire: Social-Emotional (ASQ:SE). A written consent form approved by the university ethics committee, the NHS Regional Ethics Committee, and each of the hospital trusts was given prior to participation. Toys supplied consisted of the Early Learning Centre *Happyland Goosefeather Farm* and the *FT Lift-Off Rocket*. A *Panasonic* SDR-S26 set on a tripod recorded interactions. The researcher had appropriate Disclosure Scotland and Criminal Records Bureau certification.

Results

The constitution of the groups in terms of age was analysed to ensure there were no significant differences between the two ENT groups.

Figure 12: Mean age of participants – comparison across groups
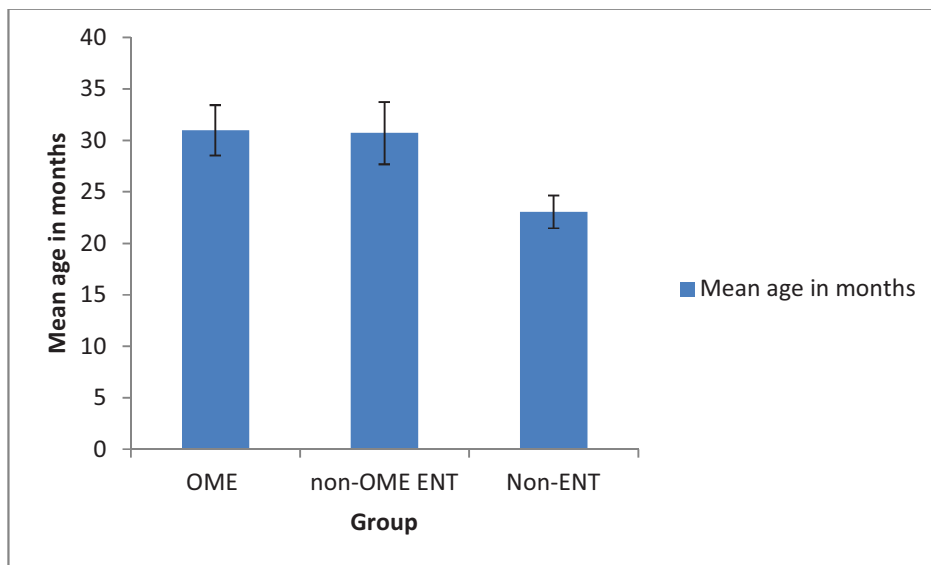
N = 38 (OME = 14, non-OME = 11, non-ENT = 13)

Figure 12 shows the mean age in months for Group 1 = 31.00, *SD* = 9.17, *SE* = 2.45; Group 2 = 30.73 for, *SD* = 10.06, *SE* = 3.03; and Group 3 = 23.08, *SD* = 5.78, *SE* = 1.60; total group mean =28.21, *SD* = 9.05, *SE* = 1.47 (*N* = 38). Groups 1 and 2 are similar (reflecting an older average age of children referred to clinical care), whilst Group 3 has a mean 7-8 months younger than the other two. A One-way ANOVA showed no significant differences for age across the 3 groups: $F(2, 35) = 3.64$, $p = 0.04$, $\eta^2 = .17$. Bonferroni post-hoc tests revealed that there was no significant difference between any of the group pairings: Group 1 and Group 2: $p = 1.00$; Group 1 and Group 3: $p = .06$; Group 2 and Group 3: $p = .10$.

Socio-emotional concerns

ASQ: SE scores of individual participants in each group were analysed to record whether any had reached a level above the threshold (where results above threshold, indicated parental concerns for their child's socio-emotional behaviours). These results are depicted in Table 21.

Table 21: Comparison of ASQ: SE scores across groups showing number over threshold

Group	No. of participants above threshold	No. of participants at threshold	No. of participants below threshold
1 (OME)	6	1	7
2 (ENT w/o effusion)	1	0	10
3 (non-ENT)	0	0	12

Table 21 reveals that more parents in Group 1 indicated higher concerns regarding their infants' socio-emotional development than parents from Group 2 or Group 3. Indeed, of the 7 who were below threshold in Group 1, 3 were within 5 points of threshold, whereas only 1 in Group 2 was so. This finding was in line with the expectation that OME children would have greater difficulty in this area. The overall difference in scores is shown in Figure 13.

Figure 13: Mean point score for ASQ: SE questionnaire – comparison of groups
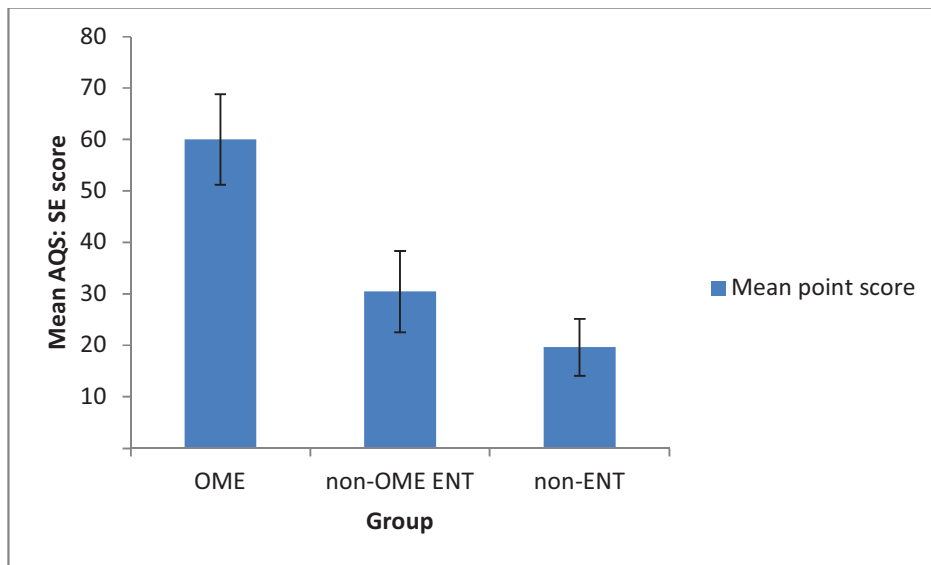
$N = 38$ (OME = 14, non-OME = 11, non-ENT = 13)

Figure 13 shows the mean scores for each group. Group 1: OME group ($M = 60.00$, $SD = 32.93$; $SE = 8.80$); Group 2: non-OME ($M = 30.45$, $SD = 26.22$; $SE = 7.90$); and Group 3: non-ENT ($M = 19.62$, $SD = 19.94$; $SE = 5.53$); total mean for all groups ($M = 37.63$, $SD = 31.85$; $SE = 5.17$). This reflects a greater concern amongst parents regarding social-emotional behaviour for children in the OME group. A One-way ANOVA showed this result as significant: $F(2, 35) = 8.02$, $p = .001$, $\eta^2 = 0.31$. Bonferroni post-hoc tests revealed where significance occurred: Group 1(OME) was significantly different from both Group 2 (non-OME), $p = .03$; and Group 3 (non-ENT), $p = .001$ respectively. There were no significant differences between Groups 2 and 3 ($p = 1.00$).

Analysing the ASQ: SE data in more detail

To ascertain further information regarding the differences in these scores, analyses of the individual assessment areas were undertaken: namely, for the areas of self-regulation, compliance, communication, adaptive functioning, autonomy, affect, and interaction with people. Each question within the ASQ: SE is related to one of these areas only therefore it is possible to measure the frequency with which a specific area arises. The mean frequency for each group is shown below in Figure 14.

Figure 14: Specific areas of socio-emotional development – comparison across groups
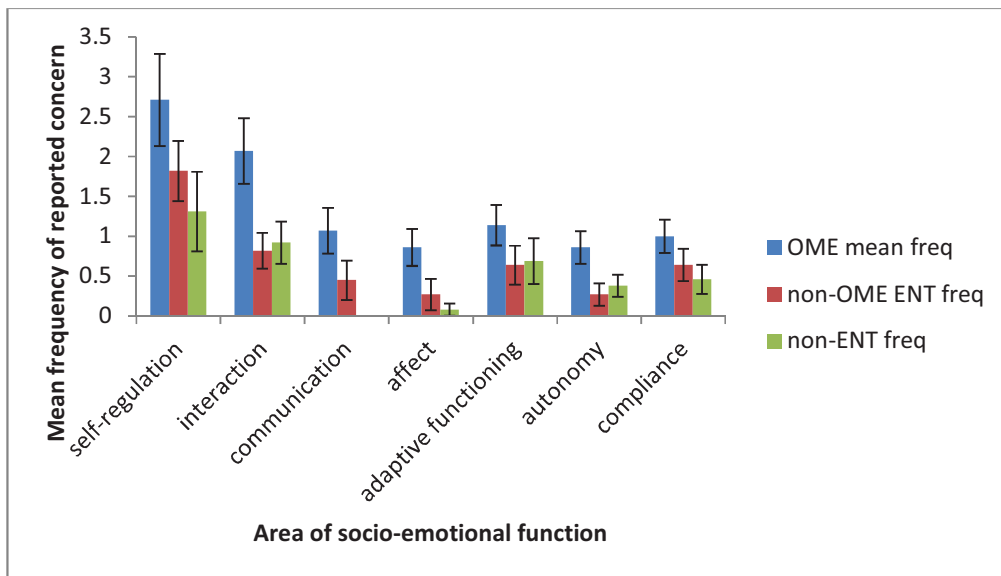
N = 38 (OME = 14, non-OME = 11, non-ENT = 13)

Figure 14 shows the OME group received a higher frequency of negative responses regarding all areas of socio-emotional development measured in the ASQ: SE. This is reflected in the higher mean scores (although only when the total score goes over the

289

threshold is it noted as a concern). One-way ANOVAs indicated that some of these differences across the groups were significant.

For interaction: $F(2, 35) = 4.69$, $p = .02$, $\eta^2 = 0.21$; for communication: $F(2, 35) = 6.32$, $p = .005$, $\eta^2 = 0.27$; for affect: $F(2, 35) = 5.25$, $p = .01$, $\eta^2 = 0.23$; and for autonomy: $F(2, 35) = 3.37$, $p = .05$, $\eta^2 = 0.16$. Bonferroni post hoc comparisons revealed where these significant differences occurred: for interaction with others there were significant differences between the OME and non-OME ENT group ($p = .03$), and between the OME and non-ENT group ($p = .05$); for communication there were significant differences between the OME and non-ENT group ($p = .003$); for affect there were significant differences between the OME and non-ENT group ($p = .01$); for autonomy the difference between the OME and non-ENT group was just outside of significance ($p = .07$). These findings are interesting not only in relation to how the OME group differs from the non-ENT group but importantly how it differs from the non-OME group, too.

Nonverbal and pragmatic skills in children with OME

The study moved to investigating the nonverbal and pragmatic skills displayed by each of the groups during play testing sessions. Specifically, elements of eye gaze and joint engagement (JE) were coded and compared across the groups as these had already been shown to link to language development (see Chapter 2). These were analysed for frequency and duration. These results are shown below in Table 22.

Table 22: Mean frequency for child nonverbal skills used in interaction with parent (8 mins)

Pragmatic skill/Group	Child makes eye contact with parent during play (**duration**)			Child makes eye contact with parent during play (**overall freq**)	Coordinated Play (**duration**)		
	Length of look to parent (< 1 sec) – glance looking	Length of look to parent (1-3 secs)	Length of look to parent (> 3 secs)		Length of coordinated joint play (< 3 min)	Length of coordinated joint play (3-5 min)	Length of coordinated joint play (5-8 min)
OME (*N* = 13)	9.85 (*SD* = 6.32; *SE* = 1.75)	6.54 (*SD* = 4.37; *SE* = 1.21)	.69 (*SD* = 1.25; *SE* = .35)	17.08 (*SD* = 9.78; *SE* = 2.71)	2.54 (*SD* = 2.73; *SE* = .76)	.46 (*SD* = .52; *SE* = .14)	.15 (*SD* = .38; *SE* = .10)
Non-OME ENT (*N* = 10)	5.15 (*SD* = 6.07; *SE* = 1.92)	5.59 (*SD* = 6.69; *SE* = 2.12)	.30 (*SD* = .48; *SE* = .15)	11.04 (*SD* = 12.24; *SE* = 3.87)	3.40 (*SD* = 2.76; *SE* = .87)	.30 (*SD* = .48; *SE* = .15)	.10 (*SD* = .32; *SE* = .10)
Non-ENT (*N* = 13)	3.38 (*SD* = 2.33; *SE* = .65)	5.38 (*SD* = 4.66; *SE* = 1.29)	.77 (*SD* = 1.01; *SE* = .28)	9.54 (*SD* = 7.40; *SE* = 2.05)	2.00 (*SD* = 2.74; *SE* = .76)	.54 (*SD* = .88; *SE* = .24)	.31 (*SD* = .48; *SE* = .13)
Total (*N* = 36)	6.21 (*SD* = 5.76; *SE* = .96)	5.86 (*SD* = 5.08; *SE* = .85)	.61 (*SD* = .99; *SE* = .17)	12.68 (*SD* = 10.09; *SE* = 1.68)	2.58 (*SD* = 2.72; *SE* = .45)	.44 (*SD* = .65; *SE* = .11)	.19 (*SD* = .40; *SE* = .07)

One-way ANOVAs were conducted to investigate whether the means of any of these features were significantly different across the groups. None of the JE scores were significant for any of the timescales measured. JE for less than 3 minutes: $F(2, 33) = .74$, $p = .48$, $\eta^2 = 0.04$; JE for 3-5 minutes: $F(2, 33) = .37$, $p = .69$, $\eta^2 = 0.02$; JE for 5-8 minutes: $F(2, 33) = .85$, $p = .44$, $\eta^2 = 0.05$. In terms of looking behaviours the following results were found: frequency of making eye contact: $F(2, 33) = 2.13$, $p = .14$, $\eta^2 = 0.11$; length of look less than 1 second (glance): $F(2, 33) = 5.41$, $p = .009$, $\eta^2 = 0.25$; length of

look 1-3 seconds: $F(2, 33) = .18$, $p = .84$, $\eta^2 = 0.01$; and length of look over 3 seconds: $F(2, 33) = .69$, $p = .51$, $\eta^2 = 0.04$. Thus, only glance-looking was significantly different across the groups. Bonferroni pairwise comparisons showed that the significant difference was between the OME and non-ENT group ($p = .01$). The difference between the OME and non-OME ENT groups was $p = .11$).

Family quality of life measured by the PAR-ENT QoL

Having investigated general socio-emotional functioning and nonverbal behaviour during interactions, attention now turned to a quality of life measure: the PAR-ENT QoL. Due to its specificity for ENT conditions, Group 3 did not complete this. Results are shown in Figure 15.

Figure 15: Mean scores for PAR-ENT Quality of Life questionnaire: comparison of ENT groups
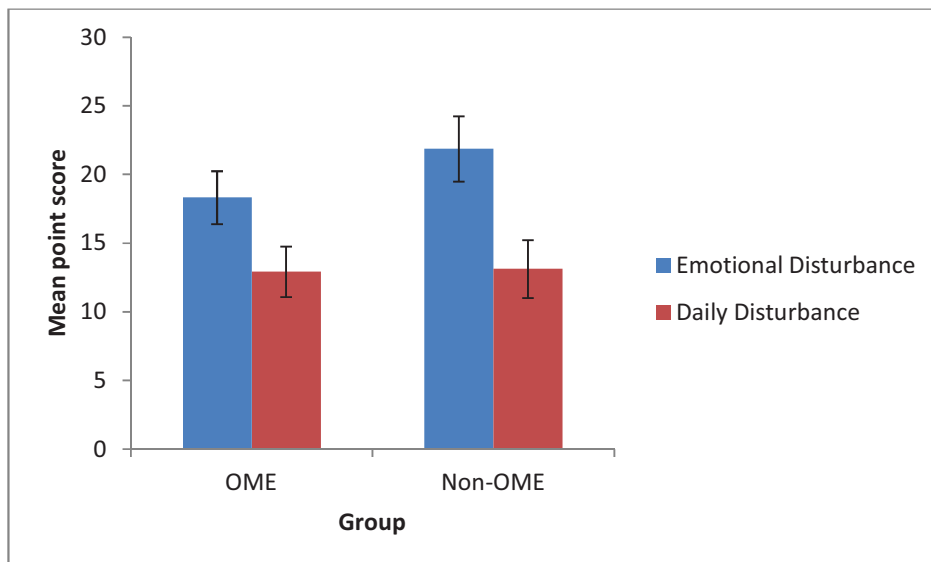
$N = 12$ (OME); $N = 8$ (ENT w/o effusion)

292

Figure 15 shows the scores for Emotional Disturbance (ED) and Daily Disturbance (DD). Only 22/29 participants completed this questionnaire, with fewer parents from Group 2 answering the questions which they felt were irrelevant to them. Two of the participants had to be omitted from Group 1 due to additional difficulties. Mean Emotional Disturbance is higher than Daily Disturbance for both groups. Emotional Disturbance mean scores per group were: Group 1 (OME) = 18.33, SD = 6.68, SE = 1.93; Group 2 (ENT w/o effusion) = 21.88, SD = 6.75, SE = 2.39. Daily Disturbance mean scores per group were: OME = 12.92, SD = 6.37, SE = 1.84; ENT w/o effusion = 13.13, SD = 5.96, SE = 2.11.

One-way ANOVAs showed no significant differences for either Emotional or Daily Disturbance: $F(1, 18)$ = 1.34, p = .26, η^2 = 0.07 for Emotional Disturbance, and $F(1, 18)$ = .005, p = .94, η^2 < .001 for Daily Disturbance.

To investigate individual areas of the PAR-ENT QoL further, data from each of the ENT groups were compared to those found by Berdeaux et al. (1998) who had conducted the questionnaire across 5 European countries. These can be found in the table below (Table 23). Mean relates to the relative score on the Likert scale (1 least effect, 5 the most).

Table 23: Questions posed in the PAR-ENT QoL questionnaire and the mean scores for
each group: comparing Groups 1 and 2 means from the current study with the
composite means found in the 1998 study across 5 European countries

Question type	Group 1 (OME) mean ($N = 12$)	Orig PAR-ENT QoL mean	Group 2 (ENT w/o effusion) mean ($N = 8$)
Q1 Worry	2.92 (*SD* = 1.08, *SE* = .31)	3.02	4.00 (*SD* = .76, *SE* = .27)
Q2 Stress	2.83 (*SD* = 1.27, *SE* = .37)	2.67	3.25 (*SD* = 1.39, *SE* = .49)
Q3 Less patient	1.83 (*SD* = 1.03, *SE* = .31)	2.11	1.75 (*SD* = 1.17, *SE* = .41)
Q4 Annoyance	1.58 (*SD* = .10, *SE* = .29)	2.26	1.38 (*SD* = .74, *SE* = .26)
Q5 Morale affected	1.83 (*SD* = 1.12, *SE* = .32)	2.26	2.38 (*SD* = 1.19, *SE* = .42)
Q6 Sleep quality affected by any of the above	2.25 (*SD* = 1.55, *SE* = .45)	2.44	3.25 (*SD* = 1.58, *SE* = .56)
Q7 Less time available for other family members	2.33 (*SD* = 1.30, *SE* = .38)	2.2	2.13 (*SD* = 1.36, *SE* = .48)
Q8 Leisure restriction	2.75 (*SD* = 1.36, *SE* = .28)	2.67	2.50 (*SD* = 1.31, *SE* = .46)
Q9 Daily life disturbed by last min changes	2.25 (*SD* = 1.29, *SE* = .37)	2.24	2.38 (*SD* = 1.31, *SE* = .46)
Q10 Quality of work disturbed	2.42 (*SD* = 1.31, *SE* = .38)	2.13	2.38 (*SD* = 1.30, *SE* = .46)
Q11 Routine affected	2.00 (*SD* = 1.27, *SE* = .38)	1.91	1.75 (*SD* = 1.04, *SE* = .37)
Q12 Out of pocket expenses	1.33 (*SD* = .65, *SE* = .19)	1.92	2.00 (*SD* = 1.85, *SE* = .66)
Q13 Helplessness/ powerlessness	2.25 (*SD* = 1.14, *SE* = .31)	2.03	2.50 (*SD* = 1.60, *SE* = .57)
Q14 Repercussions on your own helath	1.58 (*SD* = .10, *SE* = .29	1.58	1.25 (*SD* = .71, *SE* = .25)
Q15 Source of tension within the family	1.92 (*SD* = 1.08, *SE* = .31)	1.42	1.0 (*SD* = 0, *SE* = 0)
Q16 Wake up during the night	3.17 (*SD* = 1.12, *SE* = .32)	3.44	3.38 (*SD* = 1.85, *SE* = .65)
Q17 Satisfaction with the child's treatment	3.82 (*SD* = .87, *SE* = .26)	2.03	3.86 (*SD* = 1.22, *SE* = .46)
Q18 Overall quality of life	2.00 (*SD* = .95, *SE* = .28)	2.2	1.71 (*SD* = .95, *SE* = .36)

Table 23 shows that generally parents in the current study responded with answers at the lower end of the Likert scale (with 1 relating to negligible effect, 2 to slight effect, and 3 to a moderate effect). These findings were very similar to Berdeaux et al.'s (1998) results. The current study suggests that the majority of UK-based parents are very satisfied with their child's treatment, although as the testing took place at clinic appointments, unlike in the original PAR-ENT survey, this may account for the much higher score. A One-way ANOVA revealed significant differences between the thesis study groups for parental worry related to the child's condition: $F(1, 18) = 5.99$, $p = 0.025$, $\eta^2 = .25$; as well as for the condition causing tension and argument within the family: $F(1, 18) = 5.62$, $p = 0.029$, $\eta^2 = .24$. Table 23 suggests that parents in Group 2 responded with a higher level of worry, whilst Group 1 suggested more tension and disagreement in the family in relation to the child's OME.

8.8 Discussion

Hypothesis 1: Parents of children with chronic OME would show more socio-emotional concern for their child than parents of children in the other groups. Forty-three percent of parents in the OME group gave responses which pushed their child above the threshold for concern, whereas only 9% in the non-OME group did so. There were no children from the non-ENT group who were above threshold. Standardized scores of socioemotional development were significantly worse for the OME group when compared to both the non-OME and non-ENT controls. This supports the hypothesis. **Brief summary**: Children in the OME group received twice as many references in the ASQ: SE questionnaire to concerns as the non-OME ENT group, and three times as many as the non-ENT group. Statistical analyses showed that this

difference was significant against both groups. Closer investigation of the individual areas measured in the ASQ: SE was prudent. The OME group had most references across all of the areas, although only some of these were significant; namely, those related to interaction with others, communication, affect, and autonomy.

The interaction with others category is particularly interesting as the OME group differed from both the non-OME ENT and the non-ENT groups. This may indicate different (or lack of) strategies in the OME group when interacting with others. There were no differences between the non-OME and non-ENT groups on any of the variables. Squires et al. (2003) who devised the ASQ: SE defined 'interaction with people' in the manual as 'the child's ability or willingness to respond to or to initiate social responses to parents, other adults, and peers' (2003, p13). Thus, children need to recognise such actions as communicative, intentional, and shared (e.g. Tardiff et al., 2008; §1.8; §2.2; §6.3). The longitudinal study detailed the necessity of these foundations within language and socio-emotional development. It is hypothesised here that it is the inconsistency of the OME condition, along with its asymptomatology that undermine the infant (and parent's) ability to maintain a predictive format when interacting. The ability to look at the right time for sharing another's intent may break down to the lack of attuned timing. This has an effect on intersubjectivity and overall synchrony – elements which were highlighted in Chapters 2 and 3 for their importance to the valence of interaction and communication. Equally, initiating dialogue within a communicative framework which has experienced episodic breakdown and repair may render the on-going situation difficult.

In 1996, Vernon-Feagans et al. studied children attending day care provision to see if chronic otitis media, that had an onset during the first 3 years of life, had an effect on their behaviour. They concluded that these children were more likely to play alone and have fewer verbal interactions with peers (positive and negative), possibly leading to the development of a more socially-withdrawn child. Bamford and Saunders (1985) mentioned how debilitating OME can be in noisy environments, including an inability to localize sound accurately or to filter out speech streams from extraneous background noise. Infants suffering from recurring but fluctuating bouts of the condition are likely to become confused when trying to process and make sense of an ever-shifting signal. These factors arise well before educational attainments are an issue and may preclude issues facing specific areas of language development (such as lexicon, syntax, etc.) per se. The current study implies that a more pragmatic approach overall is required to assist and support such children to develop communication skills (not to mention the maintenance of self-esteem) in a conducive environment. This means giving parents the appropriate skills and information to support their child at home, too.

As the OME group was also significantly different from the non-ENT group for communication, affect, and autonomy there are further long-term implications. The non-ENT group was 7-8 months younger than both of the ENT groups, therefore whilst infants may accelerate in communication skills with targeted support, there are issues associated with affect and autonomy which may be more intransigent and may not receive attention. If attachment and socio-emotional research is correct in its assertion that affective development within the first three years of infancy is crucial to reward and planning mechanisms, then these areas should not be ignored during clinical periods of

'watchful waiting'. One proviso in comparing the OME group to the non-ENT group here, however, is that the latter consisted of participants from the longitudinal study and therefore had received enhanced intervention (from the verbal and nonverbal enhancements only). A non-ENT group without such intervention might not show the same degree of difference.

Previous research, by focusing on language acquisition, including vocabulary development and syntactic processing, has omitted the pragmatic factors of communicative interaction which maintain the dialogue, such as intent-reading, joint attention, and cooperation (e.g. Tomasello, 2003, Yule, 1998). The current study was not able to go into depth on all of these areas; however, looking behaviours and joint engagement were selected as these had been focal points in the longitudinal study.

Hypothesis 2: Chronic OME would have an effect on the child's pragmatic and nonverbal communication skills. **Brief summary**: In analyses of joint engagement and looking behaviours it was found that, whilst occurrence of joint play did not differ across groups, children with OME engaged in significantly more glance-looking (under 1 second long) than children in the non-ENT group. There was a similar trend when the OME cohort was compared with the non-OME ENT group. A larger study could establish whether real differences between the OME and a non-OME group do exist.

There is a dearth of research on the development of pragmatic language skills, especially amongst infants/children with fluctuating hearing loss. Of the few studies which do exist, the two by Yont and associates stand out (see §8.4.6). Their findings implied that a noted development found in typically-developing infants is missing or

distorted amongst children with fluctuating ENT conditions. In both their 2001 and 2003 studies, there was considerable variation, therefore aspects such as binaurality, severity, age of onset, and chronicity may all exert some influence. Further investigation with larger groups controlling for these issues is required. Nevertheless, as these pragmatic skills foster optimal language learning conditions, investigation and targeted intervention are implicated. The Yont et al. studies suggest that early intervention might assist in identifying infants at risk of subsequent language delay.

By separating the children with chronic OME from the wider spectrum of OM in the present study, it seems that OME may present a longer-term effect on these skills, the importance of which has been emphasised throughout this thesis (e.g. Adamson & Bakeman, 1991; Bruner, 1983; Dunham et al., 1993; Mundy et al., 2007; Tomasello & Farrar, 1986). Snow et al. (1996) remarked that intentional communication develops early via elements such as the use of gesture. The paucity of its production in children with OME shown in previous research highlights the links within the speech-gesture system and indicates potential expressive difficulties which might be ameliorated by offering parents appropriate communication strategies and support.

This thesis study tried to ascertain the establishment of joint attention frameworks. It found that children with chronic OME were more likely to engage in glance-looking than either of the other two groups. This consisted of frequent looks lasting less than a second. Previous research has investigated different types of visual referencing including social referencing and visual check-back. The first of these relates to identified infant patterns of looking, used where the context is ambiguous or feels threatening (Feinman, 1982). The infant looks at the parent to ascertain whether the

situation is safe to approach or whether withdrawal is a better course of action. Consequently this type of visual referencing is linked to affect as well as social cognition. Visual check-back closely resembles triadic joint attention: that is, the child looks between an object and another person, viewing them as united in one meaningful frame.

Aarne and Tallberg (2010) looked at the visual checking-back skill in a sample of children with SLI, comparing them with typically-developing infants (divided into two groups: one matched in age, one matched in language ability). They found that children with lower language levels (i.e. the children with SLI and the younger typically-developing infants) were less likely to check-back than those with higher language levels. They also discovered that when they did use checking-back behaviours the children needed more time to consider the united frame. They concluded that visual check-back was related to language level, emphasising that language, social cognition and intersubjectivity are all linked. Tied to this research are the findings of Farrant et al. (2006) who produced evidence to suggest that children with SLI also have a delay in visual perspective-taking (VPT). If any of the triumvirate of joint attention, social cognition, and language is impaired, it is conceivable that effects upon the other areas may emerge.

How might these findings relate to those found in the present study? Firstly, all children across the groups had similar looking patterns therefore any interpretations necessitate caution. Children filmed whilst attending hospital may have expressed anxiety because of the location and event. However, it is possible that glance-looking fulfilled not the

function of comfort-seeking or social referencing but that it may have resembled the visual checking-back seen in children with SLI or younger typically-developing children. These children attempt to ascertain the object of the parent's eye gaze/attention/verbal output by engaging in glancing back. In this sense glance-looking may be indicative of a break-down in intersubjectivity, timing and shared reference, albeit not severe enough to disrupt joint engagement. It is possible that the wide age range (17-47 months) masked some of the issues that occur as older children (who have received treatment for longer) may have begun to repair pragmatic skills which they previously lacked. When infants up to the age of 44 months were investigated, there were significant differences between the OME group and *both* of the other groups but these comparisons by necessity were small. Larger comparison groups within a shorter age range may address some of these issues more fully; whilst having access to more sophisticated timing equipment may find greater differences across the groups.

Kogan and Carter (1996) showed how a still-face paradigm affected 4-month old infants. An older child, with accumulated experience of unpredictability within interactions due to hearing dysfunction, may be aware of such breakdown in continuity but seek to repair and maintain the interaction, albeit by following rather than initiating attention. Such awareness may engender anxiety and stress, and increase the likelihood of withdrawal in socially-demanding situations such as at playgroup, nursery or school (Creps & Vernon-Feagans, 2000; Gouma et al., 2011; Hall et al., 2009; and Vernon-Feagans & Manlove, 2005). Fagan (2008) found that infants 17-25 months in age reacted differently to parental responses depending on whether the latter asked for clarification or assumed that they had understood the infant correctly first time. If parents asked for clarification the infant adapted their initial request in an attempt to

make it understood but if the parent responded positively - even if this involved providing a substituted goal - the infant tended to accept it. Older children who may not initiate nonverbal cues to clarify their intents may have affected reward and motivation mechanisms operating.

Hypothesis 3: Chronic OME would have a greater impact on family life than other ENT conditions, such as throat problems. Scores for the two groups were not significantly different therefore this hypothesis was not supported.

Parental responses from each of the ENT groups were similar for both emotional disturbance and daily disturbance therefore family life appeared to have similar levels of disruption attributed to the specific condition. Children around the age of 21-22 months had the highest scores (two from the OME group, one from the non-OME group). Parents of non-OME ENT children expressed more worry regarding the child's condition than in the OME group. This may reflect the expression of a more evident symptomatology, although, given that only 8 parents within the non-OME group responded, more data are required to be certain of any actual difference. Equally, the higher incidence of tension and disagreement in families where the child has chronic OME merits more study. Again, this may relate to the *a*symptomatology of the condition or may involve discussion regarding invasive treatment. Discovering when such disagreements and tensions occur (for example, cumulatively as a result of communication breakdown during interactions, as a consequence of the child's behaviour, during the 'watchful waiting' period, and so on) is indicated so that support may be allocated.

In engaging with the Quality of Life (QoL) format, parents tended to keep their responses to the less extreme values of negative effect, a possible artefact of the questionnaire design. Likert-type scale formats tend to encourage responses that are central or less severe due to social desirability factors. Alternatively parents may have underplayed the effects on themselves which they may not have done if asked, for example, to respond on behalf of other siblings. Kubba et al. (2003) investigated quality of family life for youngsters aged 1-14 years. They suggested that the *child's* quality of life was worse for those with chronic AOM and sore throats. However, results were interpreted in relation to number of episodes, degree of severity and time lost from school. Whilst there is no disagreement here in relation to their findings, it is argued that the socio-interactive impact may be underestimated in general interactions for the child suffering from OME. Ultimately, it is proposed that by using another measure alongside the QoL, such as the ASQ: SE, it may assist in attaining a better understanding of how the child is functioning socio-emotionally within a real life context.

The current results add to previous studies in this area of research. Due to the spectral nature of OM, few studies have attempted to separate different types to investigate them separately (e.g. Brouwer et al., 2005; Kubba et al., 2004 and 2005). It may be viewed as controversial to divide the spectrum in this way. Yet, as already explicated in the introduction, unlike AOM, OME can be a hidden condition with no external physical symptoms such as earache. It is conceivable that the less evident symptoms of OME could lead parents to conclude that any problematic behaviour displayed by their child is linked to temperament or to some other inherent aspect of their child's disposition rather than to an underlying medical cause. Current results suggest OME could be indicated from the child's social-emotional interactions. There are, of course, many

303

reasons why a child may have problematic interactions with others but OME may not be highlighted as a specific issue. As such, separating the spectral differences could be helpful. As techniques have improved for doing this, such studies could prove informative, especially in allocating provision.

One major problem when looking at OM is its heterogeneous and dynamic nature. The severity of bouts, whether it affects one ear or two, when it starts and how long it lasts, as well as whether there is an effusive element, and whether that effusion is serous or viscous, are all elements that can have a deleterious effect. Few studies have been able to tease these differences out, primarily due to the costs involved in following the course of the condition so precisely. In 1997, Hogan et al. conducted a prospective study on children between birth and 3 years of age to ascertain any patterns of duration or recurrence of OME amongst them. Of 95 full-term infants, they found that 17 had unilateral or bilateral OME for more than half of their first three years, 33 had experienced OME for more than a third of their early life. The main difference between the groups was not severity, duration or whether it was mon-or binaural, but the overall number of episodes the children endured. Infants who suffered more episodes were deemed to be more susceptible to it overall. They concluded that children under the age of 2 years may be more susceptible to recurrent effusion than older children, but that six monthly clinical appointments ought to be able to pick up any child with more vulnerability to OME.

For this reason, children with effusion at their last two clinic appointments (for new referrals presenting with effusion at the primary level followed by the clinic level) were separated from non-effusive cases over the same time frame in the current study.

Results gained from the ASQ: SE in particular showed that these more vulnerable cases may well be distinguishable from the more generic OM spectrum, and that targeted support could be offered to them, especially in relation to their interactions with other people. The PAR-ENT QoL data, whilst being less conclusive, also showed a trend towards interactional friction. It was notable that more parents of children in Group 2 deemed the form inappropriate to them, despite it having been devised for use with a range of ENT conditions. To date, only prospective audiological studies have been used to differentiate OME cases from the OM spectrum as a whole, and this is obviously for clinical reasons rather than for wider application. As much previous research has focused on language and educational achievement, they may miss the significance of much more fundamental processes, such as intersubjectivity and eye contact, which underlie these later skills.

There are limitations to the current study. No socio-economic data were collected so these factors could not be partialled out from the results. As OM has been associated with social deprivation in the past, this could have been an issue. However, given that the OM spectrum was divided into two separate groups, the results were sufficiently different to suggest this was not a contributory factor. The size of the groups was of course an issue, particularly in the QoL study.

A larger study is required and this should be used to focus on the accuracy of the findings shown in the current study. Nevertheless, the means for individual questions were not so disparate from those of the original PAR-ENT study, so it would be interesting to see if greater differences do arise, especially in the interactional areas. This was a positive outcome as it had not been possible to counter-balance the

questionnaires. There were issues regarding testing areas for all three groups. Group 3, being part of another study, were already familiar with the researcher and were tested in their own homes. However, being considerably younger, it might have been expected that their results, especially for the ASQ: SE could have been higher when that was not the case. Equally, although Group 3 was tested in their own homes, the OME group showed significant differences from the ENT w/o effusion group which was tested under the same conditions. This suggests that neither testing location nor familiarity were at issue.

Whilst it would have been helpful to have longer video clips and have the opportunity to omit the first 5 minutes for any anomalies in commencing play, testing participants during their clinic appointments would not have made this possible. Future studies should include younger infants, under the age of 2 years, since they have been highlighted as being at more risk of recurrent OME episodes. At present it is difficult to ascertain the population of infants within this age range that attends hospital clinics for ENT conditions. The latest figures from the HES are for 2008/09 and span a child population of 0-9 years. Data from HES Online suggests that 64,476 females and 85,554 males within this age group attended ENT clinics as new referrals in England alone. An additional 89,954 females and 120,504 males were reviewed over the same period in the same age group. Obviously these figures include all ear, nose and throat referrals, and whilst the neonatal screening programme identifies many congenital hearing difficulties, most subsequent conductive problems, such as OM are likely to be treated within primary care, at the GP level. SIGN guidelines suggest that infants with persistent bilateral OME and a hearing loss 25 dB or less should be monitored and checked audiometrically to exclude greater hearing losses. During this 'watchful

waiting' period it should be possible to investigate further the types of joint play, interaction and multi-modal cue checking and to develop these skills where necessary. By doing so, it could be possible to improve family conditions for many, given the prevalence of OME in preschool children.

Thus, the results of the current study support the hypothesis that young children with OME are more likely to experience difficulties in their socio-emotional development than those who are free from ENT disorders. More importantly, current results suggest that their difficulties could be more severe than those experienced by children with other types of ENT condition, such as AOM or sleep apnoea, due to effects on pragmatic skills. Whilst it is expected that any such illness would have an impact on this area, it is notable that half of the participants in the OME group received a parental score for socio-emotional development which was above threshold, yet only one in the ENT w/o effusion group did so. Given that children with OME appear to be particularly vulnerable in their interactions with others, there must be an undoubted impact on family dynamics. Over time, without positive intervention, intersubjective and interactional dynamics may become confirmed patterns of negative or, at the very minimum, unhelpful transactions. Such patterns, and their effects upon the establishment of IWMs, may become more intransigent and difficult to resolve without enhanced intervention.

Chapter 9: The Impact of Social Interaction and Embodied Cognition on Infant Development

"The human brain has not evolved to absorb information from technology, but rather to absorb information from other people…," Hood, 2012.

This thesis began with an account of various theories of language acquisition. Perspectives included the proposition that infants acquire language through mimicking parental behaviour: a process of conditioning (behaviourism); and that a staged maturational timetable, requiring the establishment of cognitive processes and architecture, guides the child's development (Piaget). Chapter 1 concluded, however, that development required interaction with others (Vygotsky), and especially in infancy with key caregivers (Bruner). The social interactionist perspective offered a grounded explanation for infant language acquisition (and cognitive development). It emphasised the importance of intersubjectivity and the framework it provides for attunement (e.g. Meltzoff, 1999; Stern, 1985/2000; Trevarthen, 1980), pattern-finding and intention-reading (Tomasello, 2003).

Hood's quote above is cited to endorse this assertion but to ground the social interaction perspective properly, additional information is required. Ultimately, social interactionism can only operate if there is an understanding of embodiment (that others are "like me" - or not - and that sensori-motoric as well as affective behaviours bear some relationship to one's own personal experience. To understand others (and other groups) the types of meanings humans create are not only delineated by society but also defined by the constraints of human embodiment (Johnson, 1987). In other words,

meanings are generated from the dialectical exchange within social life but are confined to the range of possibilities offered by the sensori-motoric system (Lakoff & Johnson, 1999). This leads to the conclusion that sensori-motoric elements such as the visual system, imitation and gesture play key roles in the infant's developing understanding of social and physical environments. Moreover, the two areas of social interaction and embodiment are mediated by the development of affect which attributes emotional valences to actions and behaviours experienced. Social interaction, affect and embodiment must be viewed as interlinked in order to analyse data fully.

9.1 The social interactive perspective for language acquisition

Infants learn greatly from observation, imitation, and interaction - especially with key caregivers (cf. Chapter 1, §1.8). As a result they gain an understanding of tool use, and this includes the tool of language. Language enables interpersonal meaning and the ability to engage with social and physical worlds. Humans as social and embodied beings are therefore evolutionarily adapted to learn in this way. Prolonged attachment, IWMs, intersubjectivity, imitation, and multimodal communication are designed to encourage cultural transmission of knowledge whilst simultaneously providing the basis for developing notions of kinship, and an awareness of self and other minds (cf. Chapter 2, §2.1; §2.2; and Chapter 3, § 3.1). Part of the learning process hinges on predictability and reliability, therefore infants look for predictable patterns during social interactions so that they are better able to anticipate future events. As such, interaction underpins and impacts upon many subsequent cognitive, social and linguistic developments (cf. Chapter 1, §1.10). Whilst there are technological advances to facilitate training infants in language and cognitive development it is argued here that infants need systematic and

preferably positively-valenced social interaction with key caregivers to secure their learning. Below several reasons are outlined as to how learning may occur via social interactive mechanisms.

9.1.1 Creating predictability within dynamic interactions

The systematic development of familiar routines and interactional behaviour with key caregivers cannot be underestimated. Not only does it facilitate the conditions for infants to develop pattern-finding and intention-reading skills but it gives parents a platform to gauge when the infant is within the Zone of Proximal Development (cf. §1.8.1) and thereby scaffold the infant's learning at optimal times. Without systematization to interactions therefore, several long-term impacts can occur.

Pattern-finding and *especially* intention-reading are essential to developing a communication framework, and the acquisition of higher cognitive skills, like problem solving. As long as the overall stability of the model of engagement offered is assured, minor changes and aberrations are acceptable (cf. Chapter 3, §3.1.2/3). Without these elements infants are hampered in developing awareness and understanding of communicative intent and may become insecure in initiating communicative intent of their own (cf. §8.4.6). Moreover, their motivation to interact may be curtailed as they become more and more stressed by the unpredictability or negative valence of the situation. Thus, the necessary reciprocity required within communicative exchange is difficult to construct and maintain. In turn, this dysfunctional pattern may lead to longer-term emotional dysregulation and a flooding of stress hormones which activates defence mechanisms and withdrawal. Studies of young children and parents with faulty

timing and/or attunement show the implications of dysfunctional intent-reading and predictability (cf. Chapter 2, §2.2; §2.3; Chapter 3, §3.2).

9.1.2 The importance of reciprocity within the social interaction model

As communicative intent and the transference of socio-cultural signs and interpersonal meanings emanate from shared experiences (e.g. Gillespie, 2009; Vygotsky, 1962), Chapter 2 outlined in more detail some of the vital skills infants need to acquire and exhibit for key relationships to be established and sustained. Early gesture, such as pointing, requesting and showing, enables the infant to engage with the parent *and* with aspects of the shared physical world. In essence this is Vygotsky's premise that knowledge and history need to be available to the infant and the infant must be capable of absorbing it (cf. Chapter 1, §1.8.1). Infants must be willing to exhibit and experiment with interpersonal communicative intent in return – and imitation and gesture seem to offer excellent platforms for doing so. Reasons why follow.

9.2 Gesture, speech and socioemotional development

To communicate successfully interlocutors require *intent* to communicate, some *common* ground, and a topic which they are *motivated* to convey and expect the other to comprehend. For prelinguistic infants, imitation particularly lends itself to fulfilling their part in the interaction, especially as parents infer communicative intent as a result (§2.4). Whilst early imitation may be innate (e.g. Meltzoff & Moore, 1977), and therefore similar to imitation stemming from the mirror neuron system found in other primates (Arbib et al., 2000); later imitation appears to be based on cognitive discrimination (e.g. Meltzoff, 1995; Meltzoff et al., 2010). Poulin-Dubois et al. (2011)

implied an emergent and developing skill based on increasingly complex understanding

(of purpose and intent) borne from personal experiences of observing *reliable* others.

Predictability in the parent's behaviour therefore facilitates this emergent skill by

presenting a reliable source.

Implicit within reliability is the notion of emotional regulation. Adults who are secure

can offer infants the 'containment' of more extreme emotions and help the infant

construct representations of coping over time (e.g. Gerhardt, 2010). This may explain

why many researchers have found that infants are particularly primed towards *adults* as

their main role models (e.g. Howard, 2009; Seehagen & Herbert, 2011, although see

also Rabain-Jamin, 2001 for potential cultural differences). Findings imply that

evolutionary adaptation for bonding between infant and parent places the latter in the

role of trustworthy (i.e. consistent and secure) adult, well-placed to facilitate familiar,

safe but motivating explorative routines whilst also offering a regulatory control for

when the environment becomes overwhelming (e.g. Bowlby, 1969/82). Parents then

present safety and the opportunity to learn if they are attuned and sensitive within the

interaction.

The potential impact of IWMs on the development of (socio-)cognitive skills, including

pattern-finding and intention-reading, can be illustrated in instances where social

interaction breaks down. Parental anxiety, maternal depression, drug abuse, and child

disability have all been found to affect attunement (cf. Chapter 2, §2.3) and create long-

term difficulty in socio-emotional functioning, attention, and language (e.g. Chapter 2,

§2.2; §2.3; Kaitz et al., 2010). The reason for such detriment may be explained thus: as

humans we mind-read according to the effects others and others' behaviours have upon

us; this in turn sets up scripts for what we perceive as others' intentions, emotions and thoughts (e.g. Bretherton & Munholland, 2008). If there is no consistent pattern of interaction, there is confusion, which may lead to a lack of motivation and a predominantly negative (stressful) pattern of affect (cf. Chapter 3, §3.3). Thus, atypical interaction observed in parents with unresolved attachments may explain why dysfunctional attachments can be transgenerationally transmitted as faulty interactional patterns and IWMs are recreated (e.g. v IJzeendoorn et al., 1995; Seskin et al., 2010), sustaining dysfunctional themes within IWM scripts.

Gesture and affect do give ways of reading the behaviour of others. Consequently the visual system and how infants initially process sensori-motoric information to which they are exposed have implications on subsequent developments across different domains.

9.3 The importance of vision

As a large portion of the human brain is associated with vision (including visual perception, attention, and categorization, e.g. Pinker, 1997), and human infants are predisposed to interact, it is unsurprising that human infants exhibit an innate disposition to attend to faces (e.g. Frank et al., 2009). This attention develops particularly during the first year to include better processing of emotional expressions, following eye gaze, and recognizing different people (cf. Gliga et al., 2009; Frank et al., 2009). Hoehl et al. (2008) showed that even by 3 months, infants processed objects perceived in their environment differently according to whether parents' facial expressions were fearful towards the object or not. In evolutionary terms, processing

affective signals, especially from key caregivers, provides information regarding danger and safety. Attention to fear, then, is a survival necessity.

9.4 Right-hemispheric processing of visual, spatial and affective information

Chapter 3 outlined dominance of the right hemisphere over the first three years and expressed that visual, spatial and affective processing occurred in this region. As a consequence, bidirectional impacts could occur between facial processing of fear and the development of attachment and IWMs, especially if the infant does not achieve affective regulation. Main and Hesse (1990) commented on the effect of fearful or frightening parental contact which raised the risk of disorganized attachment and encompassed the development of negative coping strategies to deal with the stressors exhibited. Lyons-Ruth et al. (1999) added that parents with unresolved attachments may be more likely to withdraw from the infant whilst giving conflicting attachment signals. David and Lyons-Ruth (2005) later found that males and females related differently to fearful and frightening parenting, with males more likely to withdraw whilst females approached. The Beebe et al. (2008) results cited earlier in the thesis showed how parental anxiety and fear impact on synchronized gaze patterns (cf. §2.2), as well as on emotional availability. Again the studies cited for language impairment, late talkers and socioemotional development (§1.9) revealed how language and socioemotional development are intertwined. Thus, affective mechanisms (attachment and IWMs) impinge upon how an infant may interact not only with the parent but with the physical environment overall (by incorporating defence strategies when they feel under threat, engineering attempts to gain predictability when the overall pattern is negative or erratic).

9.5 How attachment, IWMs and the social interaction model impact on learning via interpersonal and embodied routes

In sum, persistently negative or inconsistent behaviour patterns (especially in terms of eye gaze, affect, touch and language) create instability in prediction; and the infant becomes emotionally dysregulated (Gerhardt, 2010). Systematic interaction and pattern building facilitates human infants to become increasingly able to read other minds in terms of affect, goals, and cognitions; and their ability to emotionally regulate in order to interpret and deal with these signals will impact on the cognitive resources they have available to do so effectively (Marvin & Britner, 2008). A dysregulated infant is less able to attend to his/her environment and learn about it as s/he is swamped in dealing with stress responses (Gerhardt, 2010). Secure attachments assist predictable interactions and positive, well-timed reciprocity assists the formation of attachment type. Applying this to the socially interactive and embodied context, predominantly negative, fearful, or dysregulated interaction is likely to impinge upon cognitive developments (such as categorization and attention) as well as the motivation to initiate interaction at all. Attunement and secure attachment type position the infant in an optimal position to learn from others, and the parent in a position of sensitivity to his/her infant's signals. Gesture provides parents with a method to establish understanding and sensitive reciprocity with their infant – and this is illustrated in the examples below.

9.6 A window into the mind

As speech develops gradually, several researchers have investigated the role of gesture in communications between parents and their prelinguistic infants (e.g. Bates et al.,

1980). Consequently, it has been discovered that gesture and speech have a very close relationship (e.g. McNeill, 1985; Roy & Arbib, 2005). Goldin-Meadow and associates (e.g. 1999; 2007) have highlighted how gesture can reveal levels of understanding before they are indicated in speech. This means that nonverbal signals can be used to offer appropriate learning opportunities at an optimum time. Equally, as the same underlying cognitive processes for planning and control underpin both gesture and speech (cf. Chapter 6) some researchers have advocated that language (however expressed) is also intimately twined with thought. McNeill (1992) wrote that speech and gesture "coexpressively embody a single underlying meaning"; and such meaning is thought to originate from language that is not "a sharply bounded system but…an emergent product of processes of semiotic and social evolution" (Kendon, 2000 p50). Iverson and Fagan (2004) postulated that the infant's vocal-motor coordination led to subsequent developments in the gesture-speech system, thereby linking embodiment to later social adaptations. In other words, sensorimotoric beginnings start to incorporate the symbols, signs and emblems of a community and vice versa (the sensorimotoric experiences we form of the world become mental representations and symbols for how we perceive other agents and non-agents to function: e.g. the movement of atoms). At the prelingual stage, part of the transmission between individuals occurs via the act of pointing.

9.6.1 The importance of pointing

Focusing specifically on pointing (cf. Chapter 2, §2.4), Goldin-Meadow (2007) showed that infants do not just use it as a tool to attract attention but as a means to communicate about objects and events within the immediate environment. Importantly, points predict

the subsequent appearance of lexical items in speech (Iverson & Goldin-Meadow, 2005), thereby evidencing the link between gesture and speech. When infants start to point they show that they have some awareness of how embodied experiences can be accessible across minds (in this instance, object perception and recognition despite different spatial positioning); and that individual goals can be communicated to others (e.g. putting one's arms out to be nursed). Declarative pointing especially suggests that infants are in the Zone of Proximal Development - for when compared to non-human primates, who use imperative pointing only (cf. §1.11), an increasingly sophisticated interpersonal social understanding in humans seems evident (§2.4.1). Above all, infant gesturing depends on parental gesturing (cf, §6.4); and on cultural preferences for other human gestures, such as nodding, waving, shaking one's head, or blowing kisses which are culturally-diverse, lending at times juxtaposed meanings to similar actions. Thus, infants learn to produce culturally contextual cues, and strive to establish interpersonal meaning with others. Each interactant adapts according to the responses and initiatives the other provides with the specific cultural foundation underpinning acceptable and unacceptable variations.

9.6.2 Reciprocity

This *mutual* nature of responsiveness is crucial. Whilst the parent takes the lead in initial interactions, the infant is not passive. Both interactants create the interaction and are instrumental in how the interaction changes dynamically (e,g. Trevarthen, 1980). By providing cues (especially multimodal) each to the other, the probability of mutual understanding increases (cf. Bahrick et al., 2004). Skills, like gesture, do not develop in a social vacuum. They emerge during relationship formations which aim to foster trust

317

and security. As this is a multimedia age, however, there is an assumption that other types of interaction may be just as effective? Are there studies to support this so far?

9.7 Direct social interaction versus multimedia input

Two research areas provide evidence to the contrary. First, DeLoache et al. (2010) tested the lexical development of 12-18 month olds, comparing four groups with varying degrees of exposure to baby media. The researchers aimed to ascertain whether there was parity in terms of successful outcome amongst them. Three groups were instructed to focus on 25 target words several times a week for 4 weeks. Two of these groups accessed target words from a DVD: one group watched and interacted with the parent whilst the DVD played, the other watched the DVD only. Another two groups consisted of a control (which had no intervention) and a group which learnt the words through parent interaction only (and therefore had no access to the DVD). The group which benefited most was for parent-infant interaction only. The group watching the DVD only was no better than the Control, and the group engaging with both parent and DVD only marginally better than these. The researchers also found that, if the parents liked the DVD, they overestimated their infant's learning from it. These data show that parents still need to be reassured of the necessity of their own direct interaction.

Yet, baby media continue to have much currency. The proliferation of infant educative tools is testament to that. A recent internet thread concerns iPads for babies (e.g. http://gizmodo.com/5532261/the-best-ipad-apps-for-babies-toddlers-and-sanity+loving-parents). The situation is problematic. Adults have been exposed for many years to multimedia tools and this can lead to an underestimation of the importance of face-to-

318

face interaction with other social beings, including infants. However, learning social skills, via a TV or computer screen is no substitute, especially in the early years of development. As the quotation from Hood at the start of this chapter implies, the social nature of human life, whilst changing due to technological advances, still requires vitally important *contact* for establishing the *foundations* of typical human social skills. These include learning intent through dynamic interactions, interpreting verbal and non-verbal cues as a consequence of experiencing familiar communicative frameworks, developing an understanding of how reciprocal interaction unfurls. Recent research shows how concerned parents are themselves regarding this (http://www.bbc.co.uk/news/education-17690875), especially parents who have multiple siblings and who sustain employment outside of the home.

9.8 Birth order and primary caregiver availability

Parents have many pressures. Chapters 4 and 5 alluded to findings which report that birth order and primary caregiver availability may affect intersubjectivity between parent and child. Lung et al. (2011) found that the dispersal of attention across several siblings could impact negatively on language development in very young infants, although this detriment reduced as they aged, with older siblings becoming positive aids later on (although note Seehagen & Herbert, 2011 above). Berglund et al. (2005) found a similar effect for vocabulary comprehension and production, adding that gender impacted with boys faring worse than girls. Various researchers have reported on differences between maternal IDS to first- and subsequent-born offspring, with parents offering less encouragement to later-born siblings to engage in verbal interaction (e.g. Jones & Adamson, 1987). Later-born siblings have shown a smaller productive lexicon

for common nouns than first-borns (Schults et al., 2012). Language delays are found amongst twins which are not attributable to pre- or peri-birth issues (e.g. Rutter et al., 2003). This suggests that diluted attention is an issue for birth order. Primary caregiver work patterns, however, are controversial (e.g. Belsky, 2008) with only varying levels of support for a potential link to infant development (e.g. Stewart, 2009). This is likely to relate to the quality of childcare provided when parents are otherwise unavailable (e.g. Vernon-Feagans et al., 2007).

9.9 Aims of this chapter

This chapter investigated to what extent the aspects highlighted above correlated specifically to infant productive skills at time-point 3 (TP3). Productive skills were chosen as there were no significant group differences in the longitudinal data and speech is known to have links to gesture production. In addition, lack of attunement and subsequent births affect parental language input, and the affective tone used by parents impacts upon infant perception of IDS (e.g. Reissland et al., 2003; Singh & Morgan, 2002) so birth order and primary caregiver work patterns were also included. To re-analyse the data, groups were collapsed into one pool and a multiple regression conducted. This was done as there were no significant differences amongst groups for attachment or gesture production and one data pool increased the level of statistical power. The results are given below. The discussion interprets the nature of the results in relation to social interaction theory and emphasises why evolutionary adaptation in humans may have favoured this developmental route.

Hypotheses

1. It was hypothesised that infant productive language measured at time-point 3 would show strong correlations to both prelingual gesture and attachment security measured at baseline and time-point 1 by the Macarthur Bates CDI. Justification for this rested on several previous studies mentioned earlier in the thesis (e.g. for prelinguistic gesture: Kirk (2009); Rowe (2000); Rowe & Goldin-Meadow (2009), Watt et al. (2006); and for attachment security: De Wolff & v. IJzendoorn, 1997; Marvin & Britner, 2008; and Thompson, 2008).

2. It was hypothesised that birth order would correlate significantly with production skills in accordance with previous studies (e.g. Berglund et al., 2005, Hoff-Ginsberg, 1998, and Lung et al., 2011, although cf. Fenson et al., 2007).

3. It was hypothesised that primary caregiver work patterns would not correlate significantly with infant production skills in accordance with previous studies (e.g. Belsky, 2008, Stewart, 2009).

4. It was hypothesised that late gesture scores at baseline and TP1 would correlate significantly with production scores and AQS scores as they reflect patterns of later (i.e. more socially- and cognitively-aware) imitative behaviour which therefore reflect attachment behaviours (e.g. Killen & Uzgiris, 1981; Meltzoff, 1999).

9.10 Methodology

Participants

Infants in the four longitudinal groups were used for the first analyses. These constituted BS group $N = 14$; EV $N = 13$; ENV $N = 11$; and Non-Intervention Control $N = 12$ (Total $N = 50$).

Later analyses were conducted on the three intervention groups when AQS scores were included: BS group $N = 14$; EV $N = 12$; ENV $N = 10$ (Total $N = 36$). Two participants (one each from the EV and ENV group) were excluded from these later analyses as they were unavailable at the equivalent age for AQ-S assessment.

Procedure for detailed analysis of the data

The target variable of WPTP3 was added to a multiple regression analysis along with predictor variables suggested from previous literature as being influential on infant productive skills. By necessity these included the collinear scores for productive and comprehension skills at the earlier time-points as it was recognised these would account for a substantial amount of the variance. Predictor variables were added using the enter method resulting in four models. Predictor variables were taken from the background questionnaire (birth order and primary caregiver work patterns), and the MCDI reports at baseline and time-point 1 (for word production at time-points 1 to 3; word comprehension at time-point 1; and for gesture (early, late & total) at baseline and TP1. Table 24 shows significant correlations found:

Table 24 Significant correlations between target variable and predictor variables at baseline and TP1

	WPTP1	WPTP2	WUTP1	BaseEG	BaseLG	EG TP1	LG TP1	Base TG	TG TP1	BO	Work
	r	r	r	r	r	r	r	r	r	r	r
WP TP3	.67***	.84***	.55***	.20	.35**	.32**	.45****	.29*	.43***	-.15	-.21
WP TP1		.65***	.68***	.31***	.24*	.49***	.57****	.32**	.59****	-.17	-.10
WP TP2			.41***	.12	.33**	.16	.39**	.25*	.35**	-.25*	-.16
WU TP1				.36**	.17	.55***	.56****	.27*	.58****	.11	-.26*
BaseEG					.51***	.53***	.40**	.78****	.48****	.13	-.16
BaseLG						.23	.47****	.91****	.46****	.002	-.33**
EG TP1							.48****	.39**	.65****	.02	.01
LG TP1								.51***	.96****	.01	-.17
Base TG									.55****	.05	-.30*
TG TP1										.06	-.14
Birth Order											-.17
Prim carer											
work											

***p≤**.001**, ** *p*≤.**01**, *p≤**0.05**

Table 24 reveals that the infant productive skill percentile score at time-point 3 (WPTP3) correlated significantly with all of the gesture scores between Baseline and Time-point 1, except for Baseline *Early* Gesture. These correlations were highly significant ($p \leq .001$) with Late Gesture at TP1, and Total Gesture at TP1. WPTP3 also correlated with the earlier time-points for words produced (TP1 and 2) and words understood (TP1). It did not correlate significantly with birth order and was just beyond significance when related to the primary caregiver score. As adding Birth Order at Model 3, and Primary Caregiver Work patterns at Model 4 made minimal impact to the previous models ($\beta = -.012$ and $\beta = -.042$), Model 2 is cited here as it had the best fit: $F(9, 40) = 16.72$, $p < .001$; $R^2 = .743$. Looking at the coefficient data, WPTP2 ($\beta = .644$); and Baseline Late Gesture ($\beta = .739$) contributed highest to the impact measured on the target variable (WPTP3). The contribution of each predictor variable from Model 2 is shown in Table 25 below.

Table 25 Measure of contribution of each predictor variable in the model

Model	Unstandardized Coefficients		Standardized Coefficients	Sig	95% C.I. for B	
					Lower Bound	Upper Bound
	B	*SE*	*β*	*p*		
2						
Constant	1.24	6.33		.85	-11.56	14.04
WPTP1	.08	.12	.09	.51	-.17	.34
WPTP2	.67	.11	**.64**	**.000**	**.45**	**.90**
WUTP1	.18	.11	.19	.10	-.04	.40
Base EG	.37	.22	.32	.11	-.09	.82
Base LG	.83	.35	**.74**	**.02**	**.12**	**1.53**
EG TP1	.09	.16	.09	.57	-.23	.41
LG TP1	.008	.38	.009	.98	-.75	.77
Base TG	-1.05	.49	**-.91**	**.04**	**-2.03**	**-.07**
TG TP1	-.02	.44	-.02	.97	-.91	.87

Note $R^2 = .79$ for Model 2

Table 25 shows that WPTP2, Baseline Late Gesture and Baseline Total Gesture explained most of the variance in the model. C.I. data confirm that these are not chance results. The adjusted R^2 score was 74% suggesting that the model had a good fit and that results could be generalized more widely. **Brief summary**: WPTP3 has shown a significant correlation with gesture, with Late Gesture at Baseline being particularly salient. Hypothesis 1 therefore is supported.

 As AQS scores were unavailable for the non-intervention group, this group was omitted and data analysed from the intervention groups only. Three models were used: Model 1: Predictor values Baseline Total Gesture, TP1 Total Gesture; Model 2 added AQS security score, and AQS dependency score; and Model 3 added Birth Order, and Work Pattern of the primary caregiver. The target variable remained WPTP3. Significant correlations were found between WPTP3 and the Baseline and TP1 scores for total gesture ($r = .38$, $p = .01$ and $r = .54$, $p < .001$ respectively); as well as with the AQS security score ($r = .32$, $p = .03$); and the Birth Order score ($r = .32$, $p = .03$). An ANOVA showed that all three models were significant. Model 3 $F(6, 29) = 3.28$, $p = .01$; R^2 adjusted $=.28$. The contribution of each predictor variable from Model 3 is shown in Table 26 below.

Table 26 Measure of contribution of each predictor variable in the reduced model

Model	Unstandardized Coefficients		Standardized Coefficients	Sig	95% C.I. for B	
					Lower Bound	Upper Bound
	B	*SE*	*β*	*p*		
3						
Constant	54.79	26.28		.05	1.04	108.54
Base TG	.02	.24	.02	.92	-.46	.51
TG TP1	.44	.19	**.45**	**.03**	**.05**	**.82**
AQS security	16.49	25.02	.11	.52	-34.68	67.67
AQS dependency	6.57	18.89	.06	.73	-32.05	45.19
Birth order	-12.19	6.47	-.30	.07	-25.42	1.04
Work pattern	-8.38	7.81	-.17	.29	-24.35	7.59

Table 26 shows that standard error is high within this model, especially for the AQ-S scores. However, Total Gesture at TP1 remains significant, providing most of the influence on the target variable of WPTP3 (β = .45). The C.I.s suggest this is not at chance level, especially as the Lower and Upper Bound scores are fairly close together. **Brief summary**: whilst security scores on the Attachment Q-Sort did correlate strongly with WPTP3, Table 26 shows the high level of standard error in the model and that the significance of this correlation could still be accounted for at chance level. Larger groups are required to support this claim.

Moving onto Hypothesis 2, it was anticipated that Birth Order would correlate significantly with WPTP3. Analyses from the four groups (including the non-intervention group) showed that there was no significant correlation between them (r =.15, p = .14). Nevertheless, Birth Order did correlate significantly with WPTP2 (r =.25, p = .04). The reduced sample of intervention groups only did show a significant score between WPTP3 and Birth Order (r =.32, p = .03). In addition it found that Birth Order correlated significantly with the security score of the AQ-S (r =.29, p = .045). In this reduced sample, there were no significant

correlations between the Total Gesture scores at Baseline (r =.14, p = .20) or at TP1 (r =.05, p = .39), with the AQ-S dependency score (r = .18, p = .14), or with Primary Caregiver Work patterns (r = .15, p = .20). **Brief summary**: these mixed findings regarding correlation between Birth Order and WPTP3 suggest tentatively that Birth Order did impact on word production. Specific anomalies within the non-intervention group (e.g. a high preponderance of males) may have skewed the results when comparing the four versus 3 groups. This hypothesis was also supported.

Turning to Hypothesis 3, it was anticipated that primary caregiver work patterns would not correlate significantly with infant production skills. In the multiple regression conducted on all four groups this was just beyond significance (r = .21, p = .07). However, primary caregiver work patterns did show significant correlations with Word Comprehension at TP1 (r = .26, p = .03). In the reduced sample set, work patterns were also found to correlate marginally with Baseline Total Gesture (r = .28, p = .048). There were no other significant results. **Brief summary**: considering these results it appears that work patterns of the primary caregiver may have a greater impact for the earliest stages of infancy when comprehension and gesture development are dominant. As there was no significant result on word production levels at time-point 3, this hypothesis was supported.

Finally, Hypothesis 4 asserted that Late Gesture in particular would correlate significantly with WPTP3 and with the AQS scores. In analysis of the full group set, Late Gesture at Baseline was found to correlate significantly with all three time-points for production used (with WPTP3 r = .35, p = .006; WPTP2 r = .33, p = .01; and at WPTP1 r = .24, p = .045). In

addition it correlated significantly with Primary Caregiver Work $r = .32$, $p = .01$. However, none of the models were significant: Model 3 $F(7,28) = 2.09$, $p = .08$. R^2 adjusted $= .18$. Coefficient data showed that WPTP3 ($\beta = .33$), AQS dependency ($\beta = .23$), and Work Patterns ($\beta = .28$) influenced the target predictor of Baseline Late Gesture most. In the reduced data sample set Baseline Late Gesture continued to correlate with the production scores (with WPTP3 $r = .47$, $p = .002$; WPTP2 $r = .44$, $p = .004$; and at WPTP1 $r = .30$, $p = .04$) but it did not correlate significantly with either of the AQ-S scores (security $r = .17$, $p = .16$; dependency $r = .11$, $p = .27$). Again the reduced sample correlated significantly with primary caregiver work $r = .32$, $p = .03$. **Brief summary**: in the full sample Baseline Late Gesture has a continuing but decreasing influence on Word Production scores across time. Influence was much steadier for the intervention groups which may tentatively suggest that intervention had an impact on the way parents utilised/thought about nonverbal behaviour in these groups. The difference in score at WPTP2 for the intervention groups only may reflect the change of form from Words and Gestures to Words and Sentences as this consolidated focus on production scores only, omitting comprehension scores. Attachment and primary caregiver work patterns do appear to have an effect at this point.

Turning to Late Gesture at TP1 (LGTP1), again correlations with all production time-points were significant within analyses of the four groups (WPTP3 $r = .45$, $p = .001$; WPTP2 $r = .39$, $p = .003$; and at WPTP1 $r = .57$, $p < .001$). It was also significantly correlated with WUTP1 ($r = .56$, $p < .001$). In the intervention groups only, LGTP1 was significantly correlated with WPTP3 $r = .58$, $p < .001$; WPTP2 $r = .48$, $p = .002$; and at WPTP1 $r = .60$, $p < .001$. In addition it correlated significantly with the AQ-S security score ($r = .41$, $p = .006$). The

primary caregiver work pattern was no longer significantly correlated ($r = .23$, $p = .09$). An ANOVA showed that all 3 models were significant. Model 3 $F(7,28) = 5.14$, $p = .001$, R^2 adjusted $= .45$. Predictor variables influencing the target variable of LGTP1 most were WPTP1 ($\beta = .53$), and ASQ security ($\beta = .35$). WPTP3 was just beyond significance ($\beta = .48$, $p = .06$). **Brief summary**: continuing gestural behaviour maintains influence on production scores. The importance of primary caregiver availability, especially at the earliest stages, is further consolidated in terms of the shifting correlation from actual presence to attachment score.

9.11 Discussion

The quote cited at the beginning of this chapter was used to illustrate the importance of others in socio-cognitive and socio-emotional development. As this thesis favoured the social interactionist perspective, this particular chapter set out to establish whether new analyses of the pooled longitudinal data could substantiate the theoretical assertion made. In the current chapter it was hypothesized that productive language would be correlated with: prelinguistic gesture; and attachment security. The results above ratify previous findings that gestural behaviour has a strong relationship to subsequent language skills; and that attachment security has a role to play.

Language and gesture

The relationship between gesture and the development of speech became of huge interest in the 1980s-90s, with Kendon; and McNeill spearheading the research. Since then it is known

that gesture and speech are closely interlinked (Capirci & Volterra, 2008; Gentilucci & Dalla Volta, 2007) and as such both can show cognitive development as well as reflecting already established concepts and ideas (e.g. Goldin-Meadow, 2000). Furthermore, gesture facilitates the expression of embodied concepts, such as directional movement, shape, and size and therefore it can reflect aspects of mental representation that are not necessarily automatically identifiable in spoken communication (e.g. Kinsbourne, 2006). In other words, despite the prominence of speech in human communication, gesture continues to play a key role in both the formation of - and alteration in - cognitive processes as well as in expressing what is already known.

The results described in this chapter reveal that gesture fulfils differing functions at different points of development. Bates et al. (1989) suggested that around the age of 1 year, the systems which link gesture to language comprehension are not necessarily the same as those linking to language production and therefore developments may occur at different rates and in different ways with each. To substantiate their claims, Bates et al. established an infant gestural classification system which divides gesture into six categories (1. Imitated gesture; 2. Communicative gesture; 3. Referential gesture (to visible context); 4. Referential gesture to specific social agents or classes of object; 5. Referential gesture to distal objects; and 6. Gestures which constitute parts of recognized sign systems.). Gestures were not required to fall into one classification only but could bridge several at a time. As a result of this classification system, several conclusions were drawn. Firstly, gesture which is imitative, socially-motivated or linked to motor development (e.g. waving 'bye' or clapping) showed greater correlations to word production than to comprehension. This may have been due to its highly context-specific nature which does not transfer beyond the nature of the specific

330

routine. Deictic gestures, however, like showing, giving, and pointing linked more with language comprehension – revealing a more robust communicative and potentially representative/symbolic intent. Enactive naming (e.g. pretend drinking from a cup) was seen to correlate with both comprehension and production although the mechanisms underlying this were unclear.

Relating the above to the various regression results for the 4 combined groups, Early Gesture scores (measured by the MCDI) were not indicated as directly significant to the WPTP3 score, although they were obviously significantly correlated with the other gesture scores, showing the interlinking between them. Fenson et al. (2007) stated that Early Gesture measurement in the MCDI should be "strongly predictive of the emergence of meaningful speech" and should "signal the onset of intentional communication" (p10) and certainly, by TP1 Early Gesture starts to correlate significantly with WPTP1 and WPTP3. This may be explained by parents becoming more aware of such behaviours, becoming sensitive to their appearance, and watching out for them actively during interactions. Alternatively infant motor control/awareness may have improved to the degree that they could now perform certain actions, such as playing peekaboo themselves. Finally, routines between Baseline and TP1 would have become more established and therefore may have incorporated a more proactive role for the infant, encouraging the infant's symbolic development. Regardless of reason, there does appear to be a development in the infant's understanding of the gestures measured from one time-point to the next which cannot be attributed to maturation alone. Rather, the development of socio-cognitive skills may have emerged and consolidated within a socioemotional context of security, exploration and interaction.

As Baseline Late Gesture (as measured by the MCDI) had impacted highly on WPTP3 in the full group data set, this became a focus of further analyses. Fenson et al. (2007) described this section of the MCDI as a measure of the infant's developing understanding of the physical and social world. Questions included a high degree of cognitively- and socially-aware imitative behaviour and therefore related to previous studies, such as Killen and Uzgiris (1981), and Meltzoff (1995). Imitative behaviour measured included parenting activities (e.g. care behaviours towards dolls or soft toys, as well as personal care activities, like brushing teeth). In attempting to relate the different categories of gesture as measured by the MCDI (Early and Late) it is evident that infants were most likely to use those falling into the first three categories. In particular, imitation was highlighted as a particular tool employed.

The role of imitation and why it is important to language development

By imitating the actions of key caregivers in their environment, infants are learning patterns of intent; along with patterns of interrelating that consolidate bonding and awareness that others are "like me" (Meltzoff, 1999). Consequently, it was anticipated that imitation would show a strong correlation to attachment behaviour and language development measures. This was borne out by the significant correlation between Total Gesture at TP1 and the AQ-S security score. The way imitation develops in infants is worth exploring further. Whilst evolutionary adaptation by necessity establishes the foundation of some interactional skills on a more automatic footing, it is clear that human interaction is highly complex and demands the acquisition of skills which are dynamic, flexible enough to respond to rapid contextual changes, and which require the ability of *all* interactants to adapt according to the needs of the situation. Imitation, whilst establishing some basic interaction and relational skills, is flexible

to a degree but does not allow for spontaneous creativity. The context of the interaction, the identity of each interactant, the history between them, and the history of engaging in a particular activity will change the nature of the event. Availability and routine therefore are particularly crucial at particular developmental points.

Thus, it seems that infants change their perception of imitation over time. In 1995 Meltzoff showed that 18-month old infants, when asked to imitate a task, do not blindly repeat the adult's actions - especially when that adult is unsuccessful in terms of the presumed outcome. Instead they perform the task with the resolution of that task in mind. This suggests that infants can update action schemas in accordance with end-goal aims. These are not explicitly stated and therefore must emanate from accumulated interaction with others which enables them to create a pattern of intended behaviours in similar contexts. Again, patterns emanate from predictable sequences, therefore the establishment of secure attachments and IWMs may well help to facilitate pattern-finding and intention-reading. The uniformity of secure attachment within the current longitudinal study for the intervention groups may have obscured how different types of attachment impact on language learning per se but had the study involved a measure of temperament and an investigation of attachment over a longer time period potential subtle differences may have emerged.

The role of attachment in language and socioemotional development

The pattern of socially-interactive skills, which are based on everyday experiences, establish a developmental framework in which attachments are formed and IWMs created. The infant needs someone to guide him/her and from whom to learn. The prelinguistic skills of pointing,

333

showing and requesting are redundant if there is no interactant who is motivated to bond with and extend the infant's involvement in their physical and social world. They are integral to sharing perceptions and other minds, to accessing language, creating memory strands and linking experiences (both embodied and social). The surge in gestural behaviour for the Enhanced Non-Verbal group (cf. Chapter 6, p160) is evidence that the environment and/or the quality of interactions can influence gesture development: parents encouraged to focus on nonverbal cues become more sensitive to non-verbal communication and thereby create optimal conditions in which gesture use develops in their infants.

The influence of environment here appears to have a predominantly socio-cognitive role rather than a socioemotional one as there was no association with socioemotional development in terms of attachment quality (although the ASQ:SE results in Chapter 7 imply some socioemotional benefit after Baseline). In support of socio-cognitive advantages, there is some research to suggest that gesture influences memory in adults (e.g. Church et al., 2007) with recall of speech being easier with accompanying gesture, and gesture memory traces degrading less quickly than speech. Relating this to infants, contrary to studies advocating poorly-formed memory in infancy (e.g. Mandler, 1998), there are some researchers who suggest that infant memory is initially swamped by too much undifferentiated detail which makes encoding and retrieval difficult (e.g. Jones & Herbert, 2006). Jones and Herbert (2006) further maintain that infants' ability to complete deferred imitation tasks, shows a developing declarative memory which improves gradually by becoming more selective in its encoding of central versus peripheral details. If this is so, gesture accompanying speech may not only help develop the ability to focus joint attention but also weight perceptual

information in such a way that it affords memory traces which are more accessible when acquiring language. The lack of significant difference for gesture between the ENV and BS groups reported in Chapter 6 shows that the *type* of gesturing does not create an advantage – rather the use of gesture per se is the crucial factor.

Socioemotional development and language

The current study clearly showed multidirectional links between gesture and attachment security, gesture and word production, gesture and word comprehension, and word comprehension and primary caregiver work patterns. In contrast, birth order appeared to impact far less in the analyses of the four groups, although it did impact in the reduced groups' analyses (intervention groups only). Considering work patterns first, the results in this chapter support previous studies which state that the availability of a primary caregiver, especially in the first year of infancy, seems to assist in socioemotional and overall socio-cognitive development which equally influence language development (e.g. Brooks-Gunn et al., 2002; Ermisch & Francesconi, 2001; Stewart, 2009). This result had not been anticipated from the current data as many of the primary caregivers in the study worked part-time and had shared care arrangements with spouses or grandparents. Brooks-Gunn et al.'s (2002) study found that when mothers returned to work when the infant was ≤ 9 months, the infant achieved a lower score for school readiness at 36 months. Effects were particularly pronounced where mothers were working ≥30 hours per week; and where mothers were not sensitive; or if the infants were male. Moreover, regardless of the quality of maternal sensitivity and child care, detrimental effects were still found for infants ≤ 9 months whose mothers worked for ≥30 hours per week. Any negative effects disappeared if the mother

returned to work after the child's first birthday. Alternatively, a study by Ermisch and Francesconi (2003) implied that children were affected by maternal employment right up till the age of 5 years. These results are troublesome. In current times, with high living costs many mothers do not have the option of choice – and some need the outlet of work for their own mental health/self-esteem (e.g. Bowlby, 1988). Equally the emphasis on mothers rather than other primary caregivers is not sufficient to make judgements on the roles that others play; or on whether intervention techniques may have an impact overall.

Stewart (2009) studied maternal work patterns in the USA. He suggested that whilst maternal work did impact upon infant development, mothers attempted to compensate as much as possible for this by reducing other activities, such as sleep and housework. Moreover, he looked at when employed mothers were available to interact with their children (0-4 years), whether these times were optimal for the child in terms of their learning receptiveness; and whether mothers used those times for enriching experiences (e.g. book-sharing) or routine care (e.g. feeding, bathing). He cites findings that suggest young children (especially 2-3 years of age) perform tasks better in the morning – and therefore this would be the optimal time for the child to engage in enriching activities. However, this is obviously problematic for mothers who work at that time, work overnight - and certainly if they are sleep-deprived.

Again the emphasis needs to be shifted towards interactions between several caregivers and the child; and certainly there is an increase in interest amongst fathers and interventions to support them in delivering quality and enriched care. Supporting parents in their endeavours to scaffold effectively, therefore, is an appropriate intervention.

336

Conversely, birth order appeared as significantly correlated only once - with WPTP3 for the reduced set of intervention groups. As it was a fairly simple measure it may have been affected by other aspects, such as the configuration of siblings in terms of age, relationship, and gender to the participant infant. Certainly earlier work suggests that the quality of the interaction and the availability of the caregiver tend to be impaired where there are multiple offspring. Hoff-Ginsberg (1998) found that the type of scaffolding mothers used was different between first and later-born children. Parents used shorter sentences and asked more questions of later-borns in comparison to first-borns. First-borns also appeared to be ahead of later-borns on vocabulary and syntactic development but later-borns had more social language and were better equipped to cope with multi-party conversations. Thus, whilst later-borns may be less likely to have one-to-one contact with the parent, they will be party to conversations in which they are not directly involved. Perhaps the significant correlations highlighted between Late Gesture and Word Production also reflect this more social environment where other siblings reside. After all, an infant may imitate an older sibling in doll play as much as s/he might imitate a parent. Ultimately, siblings can offer additional input which will interact with the types and speed of development occurring. A more sophisticated investigation, including that of sibling relationships, temperament, and age difference, might explain why Birth Order was not a particularly salient factor in the current study; and why it was highlighted for the intervention groups alone.

Conclusions

Infancy spans a period of huge cognitive and emotional development embedded in a social context. Primary caregivers play a pivotal role not only in guiding the infant towards

337

meaningful interaction by presenting them with security, reliability, exploration and systematization but also in their sensitive availability to offer enriching experiences and opportunities to learn. In this way the infant builds up patterns of how the physical and social worlds operate. By assuming communicative intent in their infants, before it is there, parents facilitate the filtering and consolidation of experiences and representations to which the infant is exposed – enabling a social interactive and embodied understanding.

Coming to recognise their own authority in interactions, the infant begins to reconcile 'being with others' with 're-establishing the personal order' (Stern, 1985/2000). Human infants do not remain entrenched in restrictive egocentric goals (compared to the captive chimpanzee who cannot alter its request or the way it is expressed) but they gradually utilise contextual cues to alter their behaviour for *inter*personal aims. Gestural behaviour as part of our interactions introduces a spatially interrelational aspect to communication which encourages socio-cognitive manipulation of the concepts involved (e.g. mental rotation, spatial awareness, establishing relationships between connected objects (categorization), and storing memory traces and networks of these). Lakoff and Johnson (1999), in stating that categorization is an evolutionary adaptation which depends on sensory-motoric awareness and development, highlighted the need in humans, as pattern-finders, to look for commonalities and differences. Simultaneously, however, they recognize that pattern-finding is not confined to an individual basis as it is equally evident that, as social beings, human culture(s) maintain patterns on a *group* level. As pointing behaviour appears to be rare in wild chimpanzees (Leavens et al., 2005) and rare with less familiar humans, it may be for a reason of kinship that captive chimps also point with their human carers (albeit *specifically* to

express desires and wants, and with no transference of pointing to communication with other conspecifics). The implication may be that there is some awareness of group affiliation in this context – but only to a degree. Crucially, in humans, where expectations are less positive for interactional success, communicative initiative can diminish (e.g. Carson et al., 1998; Fujiki et al., 2004 (SLI) Yont et al., 2001 (OME)).

Gestural behaviour assists parent and infant to understand each other's intent and to focus on specific aspects of a complex arena. To understand other minds, infants need to experience systematic interaction with them. The parent of the human infant has a greater role to play initially, judging the appropriate level for successful communication and interaction. Pitching this too high or too low, the infant will not be engaged. The scaffolding role of the parent is essential. Attachment targets the strengthening of the relationship and interaction – not necessarily the emergent skills which develop from that premise. This is similar to a third element associated with bonding and infant development: imitation.

The triumvirate of attachment, imitation and social interaction mutually work towards interpersonal understanding and cultural transmission. The work by De Loache et al. (2010) suggests that this is the most effective route even in a multimedia age. Thus, considering all of the evidence presented throughout this thesis, it is argued that the social interaction model offers the most comprehensive explanation for the way in which infants develop language. Parents provide the foundations that infants require to engage with their environment in a secure and embedded manner. The child is not an isolated explorer, or a disconnected individual who must construct the social and physical world for him/herself. Rather, s/he is

part of a social and cultural heritage to which others offer access. Evolution has ensured that both learners and teachers are highly-motivated to engage with the other in a sensitive and symbiotic way. However, when the symbiosis falters, there are cues as to how the process may be given support. It is incumbent on researchers to fine-tune the interventions available to assist and facilitate parent-infant relationships and communication. It appears that the tools required may be already there – giving parents the confidence and skills to use them is the potential challenge.

Chapter 10: General Summary and Conclusion

This thesis investigated the *holistic context* of interaction and dialogue between parent and child. It highlighted the role of the communicative environment in the development of socially-interactive behaviours (such as language and gesture) as well as in the child's socioemotional development. It intimated that subtle compositional differences within experiences shared with specific key caregivers (due to elements such as the location, timing and duration of the activity, intentions of each interactant, who else is present, whether the activity is novel or a repetition of a previous event) may place varying affective connotations on them, although the familiarity of routines with others gradually impact on how interpersonal meanings are created. Moreover, aspects of primary caregiver work patterns and birth order may also have an effect. It is therefore insufficient to think of language acquisition in abstract terms: as the gradual construction of labels which are progressively applied in appropriate situations and structured in increasingly complex syntactic combinations. In other words, early play activities, which are often viewed as simple tasks, such as tower building or ball play, involve intricate skills beyond eye-hand coordination, turn-taking and physical construction to include enhanced opportunities for interpreting intent, affect, phrase consolidation, and reciprocal sensitivity in a ritualized framework. The timing of such enriching activities is also a consideration.

Bearing these points in mind, the thesis posed several questions regarding infant language acquisition. Firstly, with reference to theories of language development as well as attachment, was there evidence to suggest that the Baby Sign (BS) technique offered significantly more benefit in the areas of language acquisition and socio-emotional development than other types of social-pragmatic interventions? Secondly, how did chronic illness (specifically OME and

non-OME ENT conditions) impact on the socioemotional development of young children; and what were the consequences for parent-child interaction? The findings of each of these investigated areas are given in turn below, raising potential directions for future research.

10.1 Claim 1: BS enhances comprehension and vocabulary development.

Studies conducted as part of this thesis showed that infants in the intervention groups (mean ages of 10 – 14 months) had made significant improvements in language comprehension (for phrases and words) over the Non-intervention group. This occurred despite the Non-intervention group having a wider mean age range of 10-16 months. This suggested three possibilities: one - that targeted intervention improved infant understanding. This may have been due to the development of play in framed familiar communicative routines and with familiar props; two – the researcher had an effect by giving greater parental encouragement to focus on play routines and to establish joint attention as well as use gesture in everyday activities, such as getting dressed, mealtimes and bathtime; and/or three – parents in the intervention groups *expected* their infant's comprehension to improve due to the impact of the technique and responded accordingly.

Addressing each of the above points, it is acknowledged that structured familiar routines have a positive effect on language acquisition and interaction (cf. § 1.8.2). Whilst the exact patterning of play in the Non-intervention group was unknown, it is unlikely that there was a uniform group focus on 20 minutes play/interaction per day, or a uniform awareness of JA. Equally, it is known that mere participation in studies can alter parental perceptions and thinking towards the goal of the research (the Hawthorne effect) – but this should have

affected all groups, including the Non-intervention one. Parents in all groups were volunteers and aware that the MCDI focused on language development; however, the possibility cannot be ruled out completely that parents in the Non-intervention group had lower expectations of their task involvement. Their dedication to the study over such a lengthy duration; and findings from previous BS studies involving controlled groups which have shown a difference between the technique and non-intervention, do raise the probability that the difference in the current study is accurate, especially as the pattern of development in all three intervention groups was similar. Naturally, it could be argued that parental perceptions were altered across all the intervention groups due to study participation; however, the salient point is that BS was *not* significantly different to the other social-pragmatic techniques which focused on positive interpersonal interactions. This type of comparison has not been conducted previously and therefore offers a different perspective on previous BS findings.

Alternatively, infants in the BS group of the current study did show a significant increase in their word comprehension from baseline to TP1 and this was not matched by any of the other groups. Perhaps BS highlights perceptual salience which other social-pragmatic forms do not. The difficulty with such a premise is that significant differences were not sustained longitudinally. Although this may reflect inadequate measures used to detect subtle differences over time, the similar pattern across all of the intervention groups implies that mechanisms which could have impacted on the infant's vocabulary acquisition may have been common to all three groups. Further research specifically on comprehension over a longer period of time with larger groups might help clarify these mechanisms and whether they can be enhanced by one specific technique. Equally, a study of infant perceptual skills (both visual and acoustic) could ascertain whether there are modality preferences at different

ages. This might suggest an optimal age for BS, whereas if the difference in results is attributable to parental perceptions only, this would be shown in the results.

Language comprehension, an earlier acquired skill than production, is undoubtedly complex. Even so, typically-developing infants appear to be able to make sense gradually of the speech stream, nonverbal actions, as well as the physical and social environment around them. Nativists would argue that there must be some innate constraints which facilitate the infant to perceive and attend to key features within the language to which they are exposed; however, other researchers, such as Tomasello, argue that it is the frequency and consistency of the exposure itself which assist the infant in detecting permissible linguistic patterns specific to the infant's dominant language. Thus, quality interaction dependent on rituals and routines would generate these conditions.

It is in this context that arguments regarding BS have to be analysed. To what extent does it fulfil a linguistic - as opposed to an interaction-maintaining - function? Whilst it can be shown that infants gain awareness and understanding of phonemic and syllabic patterns of spoken language; infants do not appear to engage with BS in the same way. Even if BS is a support mechanism to speech, there is an implicit view that some linguistic meaning is attached to it (enhancing, clarifying or repeating the information in another modality) otherwise BS would be no different to gesture in general (such as beat gestures in adults). Infants do not appear to exercise in manual babbling as they do with vocal babbling, so BS may function as an associative hook to maintain attention and interaction.

Schaffer (2003) suggested that words have an associative basis until they can be used outwith a concrete context. Relating this to an infant showing comprehension of a BS 'sign', the implication is that the infant's comprehension is more akin to recognition of an entire context/routine (i.e. social learning, not necessarily a representation which stands for the object/event itself in isolation). As infants seem to be incapable of iconicity until a later developmental stage, yet there is evidence to suggest that they attend to featural information contained in BS 'signs', it could be that memory (semantic) traces are formed from these interpersonal interactions. Marschark (1997) discusses the possibility of symbolic memory in infants. A study comparing the recall of prelinguistic infants after exposure to a particular narrative (play sequence) with different cues (e.g. BS versus gestural versus IDS) could highlight if BS has a mnemonic quality. Cuevas et al. (2006) have already shown that infants as young as 6 months in age can associate absent objects by the presence of another which links the two – perhaps BS 'signs' can operate in a similar way?

In sum, this study adds to current research as the findings consolidate the importance of quality interaction between the infant and key caregivers; and implies that parents, opting for particular techniques, need to be aware of the locus of effect – not necessarily in the technique itself but in how they and their infant attune to each other as well as in how the parent infers the infant's understanding. The study also highlights the need for differential measurement of comprehension – so that if embodied elements, such as the use of space, facilitate different ways of encoding representations, these should not be overlooked. Above all, however, the study shows how complex these studies are and how difficult it is to untangle the various correlations let alone causes and effects. By following the MRC Guidelines (2006), a more

simplified version of the study could clarify some of these better. For example, the guidelines suggest that complexity is easier to deal with if one theoretical standpoint is taken from the start and they offer a development-evaluation-implementation process which can be implemented for piloting and feasibility studies. The guidelines also advise on experimental designs which could be employed, such as a cluster randomised trial or a staggered recruitment programme. Certainly with focus on the social interactional theory, and with fewer time-points and a staggered recruitment, data may have been richer and easier to analyse in the current studies.

10.2 Claim 2: BS enhances language production.

Although there remain some unanswered questions regarding language comprehension, findings for language production were clear. None of the groups exhibited any particular enhanced benefit across the age range (10 - 25 months). Whilst there were individual differences in vocabulary size, these were not specific to particular types of intervention. Neither length of utterance nor syntactic development was significantly different across the groups. It could be argued that infants are still at the earliest stages of language development and therefore any differences could be revealed at later ages (particularly when vocabulary acquisition has passed a certain point; e.g. infants generally tend not to combine words or use initial question words if their vocabulary store is less than 100 words, emotion and cognitive words tend to start appearing around 200 words. This is no different if the infant is using ASL or English – Anderson, 2006). These findings show that complex, intricate and sophisticated connections develop across and between the domains of cognition, affect and language – and require time to do so.

Furthermore, if we accept speech-gesture as one system, the finding that infant production across all groups was comparable (regardless of mode) seems unsurprising. Word production involves perception of basic linguistic elements which can be brought together to form larger meaningful units; an awareness of word types and the function they play within a larger context; planning and synthesis of the thoughts that underpin them; and the execution of the utterance according to the intents of the producer and the anticipated understanding of the available audience. Conceivably, an infant who watches a parent produce a BS 'sign' is using cognitive, social and linguistic skills to respond to it; to produce it themselves, requires additional understanding of the speech act, context and audience. Without these elements the infant is engaging in mimicry or, at best, imitation. The lack of effect of intervention in early infancy may reflect the domain-general nature to language acquisition: that comprehension is an important foundation for subsequent socio-cognitive and socioemotional developments to occur – one of these developments being production itself.

How do these findings relate to previous research which has emphasised the role of prelinguistic gesture in language development? Bates et al.'s (1980) seminal work highlighted that expressive language correlated with symbolic play and imitation but did not correlate with object permanence or spatial relations. Thus, if BS does enhance perceptual salience and spatial relations, improvements may well be exhibited in terms of comprehension but not yet in production. Implicit in this is that symbolic *expression* may not yet be possible until other factors are in place (better working memory, more robust representation/categorization, longer experience of imitation). Further investigation of these areas is required.

So, why do some infants produce BS 'signs'? Killen and Uzgiris (1978) found that infants (10-16 months) produce gestures, previously modelled by adults, if they are familiar with the interaction sequence and the object is present. These gestures tend to be action schemas, although not necessarily sequenced in the same way as adult ones (e.g. an infant might pretend to feed a doll, then themselves, before stirring a pot or pouring). Older infants (around 22 months) do not gesture in play with objects as much but will reproduce adult actions regardless of whether they are appropriate or not: that is, they seem more aware of the *social* significance of nonverbal communication, regardless of symbolic relevance to the actual object itself. Thus, the labelling basis of BS becomes ambiguated by the social aims of the interaction.

Deaf infants of Deaf parents (DCDP) offer the best insight into how signing might work at this age as the data exclude all potential background confounds found in studies involving DCHP[13] or CoDAs[14]. The disadvantage is that sample sizes are consequently very small (e.g. approximately 5% of all babies born in any one day across the USA are deaf – Anderson, 2006). Additionally, studies do not always clearly demark gesture from sign in deaf children (e.g. Anderson, 2006; Marschark, 1997); and therefore some gestures in this group are assigned a linguistic or naming quality which is otherwise discounted in hearing children's gestures. This situation has led to the controversial debate of *sign advantage* – the rationale which also constitutes the basis for BS' usage.

Yet, in rigorous examinations of DCDPs and hearing children who use typical gesture, there are similarities found in terms of vocabulary size, content, and onset (Anderson, 2006); as

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[13] Deaf child of hearing parents
[14] (Hearing) child of Deaf adults

well as in their development of gesture (e.g. Cheek et al., 2001). Marschark, 1997 continues that gestures have a social-interactive function and therefore may not hold linguistic import initially. This may be why Petitto (1988) found that infants could not recognise their own 'signs' reproduced to them out of context – although they had used them previously themselves. Again, the implication is that parents *infer* meaning from the infant's gesture rather than the infant expressing symbolic content *directly*; and may explain the temporary benefit of BS for infants' pre-15 months, before various ways of interacting begin to change (e.g. Bates et al., 1980).

10.3 Claim 3: BS enhances socioemotional development.

Findings have also provided some support for impact from BS on socioemotional development, especially at the later assessment point of approximately twenty-four months. This is a time when many parents are challenged by the 'terrible twos', so, if there is an advantage for BS' infants in this area, identifying possible underlying mechanisms is helpful. Given the results of the linguistic studies above, it is unlikely that this difference stems wholly from increased language skills to overcome frustrations, worries or concerns. If this had been the case, the other intervention groups would have been expected to perform at similar levels according to the data recorded. Attachment research suggests that areas of self-regulation may affect aspects such as attention but data from the Attachment Q-Sort and the video analyses here implied there were no real differences between the intervention groups here either.

Several explanations are feasible: firstly, that BS may improve semantic memory (conceptual) within interactions and thereby provide access to a bank of affective experiences from which the infant can draw to understand and interpret social events at later stages. However, neither memory nor affect was measured in the current study, and therefore further investigation is necessary to verify this. Bretherton and Munholland (2008) highlighted Mead's interpretation of the importance of gestural behaviour between parent and child which suggested that infants gain meaning from their actions by the responses primary caregivers give to them. As parents tend to show very positive affect when a BS 'sign' is produced by their infant, this may create a preponderance of positive attunements during transactions. Compare this to confrontational scenarios where a toddler throws him/herself to the floor and screams having pointed endlessly out of the window. Moreover, where an infant has associated a label to a BS 'sign', such as 'good' or 'happy', this may be easily recalled in event schemas and evoked when the infant is in a frightening or novel situation to self-regulate. Again, infant recall and connection of BS 'signs' to pictures of positive affect (smiling faces versus frowns) at later stages might show positive links between affect and gesture.

Secondly, the parent in the BS group, by inferring meaning, may create a consistently higher degree of security and interpersonal understanding over a longer period of time as the quality/representation of the BS 'sign' does not change over time (compare this to how IDS alters with age). Although the A Q-Sort did not find differences between participants and groups for attachment security behaviour, there may be slight differences in how these interactions affect aspects such as the infant's development of self and others, especially in terms of how their communications are accepted or rejected over longer periods of time.

Combining the A Q-Sort measures with other types of attachment measure could add more definition to this information.

Thirdly, there may be a cut-off point below which overall socioemotional benefit is evident due to the sum of functioning in various areas of socioemotional development becoming greater than individual parts. For example, strong scores in the areas of self-regulation, adaptive functioning, and interacting with other people may offset any difficulties in other areas, such as compliance or autonomy in the short-term. The BS group acquired a much lower socioemotional score than all the other groups but they also started at a lower point (though not significantly so). Only the ENV group achieved a score within 1.41 of the BS baseline score – this may not be sufficient to show any threshold effects which the BS group may have reached. Further investigation of larger groups with similar scores at baseline *before* group allocation could illuminate whether BS does confer specific socioemotional advantage or not. The inclusion of measures of temperament would control for other possible confounds in the data.

Finally, Marvin and Britner (2008) highlighted a connection between gesture, speech and the gradual establishment of IWMs. They suggest that the infant creates event schemas which are dependent on specific stimuli and s/he utilises these to understand, interpret and even modify the parent's behaviours to achieve set goals. In turn, the parent adapts their own actions within these frames according to the infant's behaviour (and operating to their own IWMs). In the case of BS, the consistency of inferring symbolic communication over a longer duration within the dyad (or within the wider social unit) could impact on IWM stability and therefore on predictions of future interactive patterns. This predictability could be particularly helpful at

351

times when infants might otherwise revert to temper tantrums; for example, in situations where there is an apparent breakdown in understanding with caregivers who had previously appeared to be attuned to them. Again, future studies need to measure a longer time period to go beyond 'terrible twos' and towards greater linguistic complexity and IWM establishment.

10.4 Conclusions from the longitudinal study

All interventions based on social-interaction used in the current thesis engendered comprehension benefits. This suggests that BS does not promote a particularly unique advantage (although there are still some questions regarding single word comprehension at the very earliest stages of development). It is argued here that this finding may result in associative learning due to perceptual salience but, as these anchors begin to weaken in the face of cognitive and social interactive skills, they are not sustained. Alternatively, the skill might be a reflection of parental *perception* of its existence rather than a concrete advance per se. Ultimately it is unclear whether such a temporary early benefit may pass through a 'U'- shaped process and only returns at a later stage (beyond the time-span of these studies). As none of the interventions investigated appear to advance word production, it was hypothesised that the result may relate to the domain-general nature to language acquisition which necessitates developments in other areas, such as cognition and social-interaction for production to flourish.

The similar developmental trajectories in DCDP and hearing children imply that gesture development underpins any advances in BS as well as speech. Deaf children follow a similar pattern of gestural development to hearing children (Anderson, 2006) and methodological

anomalies in the coding of gesture versus early sign may have led some researchers to assume an early sign advantage when there was none. The role of pointing (imperative and declarative) for both DCDP and hearing children should be emphasised; and indeed, by measuring the amount parents gesture prior to using BS may highlight which infants will be more successful with it. Measuring infant perceptual skills may clarify whether the infant is ready to look for BS in addition to other multimodal cues used. Acredolo and Goodwyn stated that BS does *not* help to develop symbolic ability but may assist those who *already* possess it to express it. Tests of early symbolic ability and infant pointing may highlight differences between infants at this early stage. Finally, parental expectations of BS need to be addressed prior to starting. If a parent commences BS when the infant is 6-10 months, s/he needs to be aware that their input in terms of scaffolding play interactions is still vital. By putting the onus for play direction on the infant at this earlier stage, the establishment of quality routines can be disrupted.

BS is capable of providing social interaction but so are other interventions. Symbolic meaning is developed interpersonally and within negotiated acts (Bruner, 1983; Stern, 2000); thus, interventions like BS can offer opportunities beyond labelling to assist the infant in developing aspects mentioned previously (e.g. turn-taking) as well as a sense of self and other. This is not due to the basis of BS in symbolic gesturing but due to the construction of interactions on predictable patterns which facilitate imitation, association and socialization. It is yet to be established if different interventions exploit different mechanisms in achieving the same results or if they are all utilising the same ones. Thelen and Smith's Dynamic Systems' Theory (1994) may be able to add to this debate.

The suggestion that language comprehension is a domain-general skill is supported by the studies undertaken here. Different processes and architecture linked to other functions seem to be utilised at different times and to varying degrees (e.g. perception, embodied cognition, semantic memory). Moreover, it is through interaction with others that these linguistic skills become honed. A neglectful or dysfunctional environment can impair the development of these pre-linguistic skills as well as affect the establishment of narrative structures within IWMs. The multimodality hypothesis is supported in that the availability of redundant and overlapping cues to pick up information from interactions facilitates opportunities for the infant to 'catch' meaning from at least one - auditory, verbal, gestural, or nonverbal. As this dependence decreases over time and the child becomes more able to access and utilise information from a single modality, it seems that initial multimodal reliance may foster perceptual skills, representation and memory development. Ultimately, it seems that it is not BS per se which makes the difference – it is the holistic communicative environment which matters.

10.5 The OME study: effects of chronic illness on parent-child interactions

The thesis moved on to investigate the interactions between parents and children with chronic ENT conditions. Findings suggested that socioemotional development is influenced by OME as parents of children with the chronic condition had higher concerns (than parents of children with no OME) in terms of their child's interacting with others, autonomy, affect, and communication. Whilst gaze patterns overall appeared to be similar across all the groups, children with OME appeared to engage in glance-looking behaviours more than the other groups. This requires further investigation to substantiate.

In-line with previous research into this area, it is also argued here that chronic OME affects the parent-child relationship due to its effect on the synchrony of interactions, on the development of joint attention, and the child's use of nonverbal cues to assist understanding. This situation is likely to occur due to the inconsistent nature and asymptomatic expression of the illness. Indeed, it may be the 'invisible' nature of OME which seems to affect wider relationships within the family, causing arguments and tension. Further research is required to define why these arguments arise: is it due to discussions over possible treatments, or due to the child's socioemotional behaviour in the wider environment? The PAR-ENT QoL does not provide definition to this question and therefore further inquiry is necessary. It appears, however, that the interpersonal structure of interactions may be affected beyond the initial dyad itself; impacting both on the adult's view of being a competent parent and the child's view of mutual understanding and pleasure during interactions.

Dodgson et al. (2000) investigated the responses of 323 parents of infants between the ages of 12-30 months and who had been diagnosed with a chronic health condition (an extensive range, including 2% ENT cases and life-threatening conditions). They found that when symptoms were intermittent and unpredictable there was significantly more family distress than for those with more predictable patterns. Much of this distress stemmed from family and/or social disruption. A more focused investigation on OME is necessary to qualify whether these findings remain specifically relevant to the condition.

Certainly the socioemotional impact of interaction and communication undoubtedly influences the types of relationships in which the child engages. The fluctuations in hearing may render such children more dependent on the key caregiver and less inclined to approach

less familiar others or situations. In terms of JA, parents may be more inclined to invade the child's personal space to be certain of their attention: this is more akin to directing than following and takes the initiative away from the child. Affect may be impacted by fluctuating patterns of over- or under-stimulation of the infant (cf. § 3.3.1) and this would also influence areas of attention and behaviour.

A study by Welch and Dawes (2007) showed that hearing loss had a particularly negative effect on girls' behaviour over time (5 – 15 years); whilst Bennett et al. (2001) highlighted problems with inattention and hyperactivity up to 18 years in age (cf. §8.4.3). As OME seems particularly prevalent between the ages of 2-4 years, the longer-term impact of communication breakdown on areas such as confidence, self-esteem and affect during social interactions may be fairly damaging. Multiple experiences of such difficulty will impact on the infant's development of IWMs, their event schemas and their self-image. It is unsurprising, therefore, that previous studies have found children with chronic OME often become socially-withdrawn and anxious.

The findings from the longitudinal study in this thesis implied that structure and familiarization assisted infants in establishing many of these skills along with developing an understanding of others' intents. Yet the nature of OME seems to make the familiar less predictable (for both parent *and* child); thus, if routines appear unpredictable with familiar caregivers, the task of interacting with others outside of the home becomes an even more daunting task. Yont et al.'s (2001) study showed that infants with chronic OM use fewer communicative intents than controls. This seems to implicate weaknesses in areas including those of reward and goal-setting (cf. § 3.3.1). It seems therefore that targeting early parental

guidance in terms of interaction with a child who has chronic OME may actually provide benefit especially at this time when the right hemisphere is dominant, language development is becoming more complex and the formation of IWMs is still occurring. Parents could be encouraged to focus more on the communicative environment and the child's nonverbal behaviours. Gesture could be introduced as an additional anchor for labelling and mutual understanding when hearing is impaired at these later ages. This may encourage more helpful looking-patterns overall. Thus, early intervention could help to offset any longer-term problems. Such intervention seems particularly prudent due to the need for 'watchful waiting' policies in the clinical arena.

Why might parents of children with OME cite more concern for their child's socioemotional detriment than the non-OME ENT group?

The Dodgson et al. (2000) study may highlight the role of unpredictability in parental distress but it is likely that the reduced hearing component also has a large impact beyond the finding mentioned above. It was notable that parents of children with OME cited more concern with regard to communication than parents of children with other types of ENT conditions. In full searches of web databases, such as PubMed and Web of Knowledge no studies were found specifically on the types of dialogue which parents and children with OME have in general or about their condition. However, a closely-related area to OME research involves the study of late talkers. Van Balkom et al. (2010) commenced a study of late-talkers (when children were between 2-3 years) and found that the children had difficulty with turn-taking, initiating and maintaining topic-related dialogue. This is despite having a typical range of communicative intents. Additionally, their output was more likely to be unintelligible and ungrammatical;

with utterances at times being inappropriate to the context. Simultaneously, parents directed attention more, whilst circularly repeating themselves and topics more; and frequently correcting their child's output in a fairly robotic way.

All of these features lead to poor quality interaction and intersubjectivity, establishing negative patterns of engagement. Van Balkom et al. (2010) related turn-taking problems to misunderstandings and mistimings between parent and child. They suggested that late-talkers used techniques which were not particularly helpful to parents in establishing their communicative intents: tools such as nodding, smiling, frowning, inserting tag-questions and using ellipsis were mentioned as means children used to maintain communication but to avoid making complete utterances or to take the lead in the dialogue. Nevertheless, they also suggested that the formal syntactic development of late-talkers is not necessarily behind that of typically-developing peers; rather that it is the demands of rapid adaptation within discourse which renders them at a disadvantage.

Other studies of late talkers and children with language impairment have found that there is a high association between internalizing behaviours (such as anxiety, inhibition, and withdrawal) as well as problems with attention (e.g. Carson et al., 1998; and Redmond & Rice, 1998). In older children, negative assumptions about their capabilities continue with teachers often citing behaviour or cognitive difficulties amongst them (for example, Fujiki et al., 2004; Hart et al., 2004). Schoon et al. (2010) have found long-term associations between early receptive language skills and adult mental health. As researchers, who specialise in studying late talkers, agree that it is not clear whether there are underlying language disorders in the early years (Dodgson et al., 2000), it is essential to investigate these early socio-

pragmatic and interactional problems to ascertain whether they can be ameliorated before they are established.

In sum, it appears to be that social-interactional skills have great impact and imply that a specific focus on dealing with these within the parent-child dyad could nurture better attunement, better understanding and improve the child's confidence in social relationships.

10.6 Conclusions to the OME study

Previous research into interactions between parents and infants showed that whilst the parent may play a leading role in engagement initially, infants strive to develop an awareness and sensitivity to the parent's behaviours and goals. Ultimately, the two create a goal-corrective path between them to maintain and extend their engagement not only within a single play frame but over time too. This path is based on previous routines and interactions.

Children with chronic OME have an inconsistent pattern of engagement due to the nature of their condition which is often asymptomatic. Unpredictability renders goal-correction difficult and establishes disruptive patterns which may lead to defence mechanisms (by affecting IWMs) and partial communicative repair (cf. van Balkom et al. (2010)). Studies of late-talkers imply that targeted social-interactive intervention may help parents of children with OME in developing the latter's pragmatic skills, confidence and self-esteem; whilst at the same time giving the parents a wider range of skills from the developmental toolbox, such as scaffolding the infant's incomplete utterances, and using nonverbal techniques. BS could be used in terms of associative hooks, and could facilitate overall maintenance and repair of

conversation in a more positive way (using a wider range of conversational techniques and styles, gesture, and following the child's attention).

The longitudinal study of this thesis supported the use of enhanced socio-interactional techniques to assist parents and infants within the communicative environment. A longitudinal study with infants and children suffering from chronic OME could provide further information in terms of the mechanisms involved and provide positive assistance when communication breaks down within these families.

10.7 The challenge for future directions

The long-term benefits from the communicative environment, including quality social interaction and parent multimodality, have been shown in the studies of this thesis for both language acquisition/development and socioemotional development. These findings should reassure parents that their input far outweighs expensive courses and products which are marketed heavily to them. Parents, who are encouraged to become aware of and use the multimodality of communication, provide their offspring with rich cues to perceive and develop their linguistic and socioemotional potential. A good way to achieve this is through consistency of familiar but pleasurable routines which empower each of them to create new meanings and understandings. Whilst some parents voice concerns regarding the leading of their infant, the parent's role of scaffolding within the intersubjective framework is a crucial one (cf. §7.9). It encourages the child to maintain interaction and facilitates their advance to the next level. Scaffolding is not control – and it adapts according to the reciprocal interchange unfolding.

New technologies and products can impel parents to change their communicative environments frequently and unnecessarily. It can lead to feelings of inadequacy and self-doubt – but the findings within this thesis suggest that providing enhanced parental guidance and advice can assist them in bolstering their confidence in developing and sustaining quality interactions. Focus on products such as Baby Einstein™, and so on, takes the focus away from the communicative environment and places it on a less intersubjective, less stimulating and impoverished niveau. Parents are much worthier than that. At the same time, techniques such as BS may offer a socioemotional benefit in advance of other possibilities – and certainly may offer a communication support for children with chronic OME during times when their hearing is particularly reduced. As infants attending clinics will predominantly be between the ages of 2-5 years, the arguments of symbolic understanding of BS do not apply in such a study.

The knowledge that gesture has a positive role to play in infant development (e.g. §2.4) and the findings that its usage varies widely implies that parents trained and encouraged to use this more should provide their infant/child with a greater number of amodal cues to understand the dialogue and intentions underpinning it. Commensurate with this, is the parent's greater awareness of nonverbal cues from the infant – following their focus of attention, reading their facial and body expressions. All of these factors benefit the child's self-esteem and the affective valence of interaction within the dyadic context. Yet, thus far there has been little impetus to investigate the impact of teaching *gesture* (especially pointing) and of increasing parental awareness of nonverbal behaviour on language and socioemotional development. Such a study is implied – not only for short-term benefits but to gauge long-term effects on relationships and interactions.

361

Moreover the finding that the communicative context and dialogue deteriorate when issues such as OME occur has hitherto received little attention. Just as an infant benefits from consistency so too does the parent predict communicative patterns from previous interactions. This cycle of deterioration should not be ignored or underestimated (i.e. OME is a common often temporary childhood affliction therefore should not have long-term effects) – especially when considering patterns of chronicity and its occurrence at a time in infancy when IWMs, language, self-esteem and theory of mind are fragile. Studies such as those undertaken by van Balkom et al. (2010) show how these elements can impact greatly on both the parent and child. It is important to investigate further the mechanisms underpinning the maintenance of quality intersubjectivity at these times.

Indeed, van Balkom et al. (2010) also indicate that there is much debate in terms of the effects of late-talking within these early age groups. BS could offer some insight into the sorts of underlying problems involved. Creps and Vernon-Feagans (2000) found that infants who had had chronic OM problems between the ages of 12-24 months continued to be shy and withdrawn with friends at 7 years in age. Dawes and Welch (2010) found that children who had experienced OM along with reduced hearing were more likely to suffer from tinnitus in adulthood. Tinnitus is separately known to impinge upon psychosocial health (e.g. Vesterager, 1997). Clearly, long-term social interaction and psychosocial problems should be addressed.

At the same time as the thesis has shown support for social interaction, caution may be required when interpreting some of the more marginal results. For example, the finding that BS benefits socioemotional development may be difficult to unpack. The longitudinal study

in particular was highly complex. The MRC recommends (www.mrc.ac.uk/complexinterventionguidance) thorough process evaluation prior to embarking on a study such as this to identify any implementation problems. This was accomplished to a degree within the time constraints available but more time at the design stay could have militated against some of the issues which arose later.

Equally, it should be reiterated here that there is always the possibility of a Hawthorne effect within any study (e.g. Fernald et al., 2011). This means that participants alter their behaviours simply because they are taking part in a study. Fernald et al. (2011, p83) state that "practical studies in real-world settings may be particularly vulnerable to unintended effects on intervention outcomes…especially when they participate in studies with observational components". In the case of the longitudinal study of this thesis, parent participants were not blind to the hypothesized effects: they knew they were taking part in a study focused on language and socioemotional development and therefore were likely to form attributional biases regarding what they anticipated *themselves* as expected outcomes. Equally, parents within the OME study would have biased assumptions regarding language and play outcomes. These studies therefore were vulnerable to Hawthorne effects, unlike studies which involve naïve participants who cannot anticipate experimental aims or responses.

With these thoughts in mind, it is important to recognise that parents within the BS group of the longitudinal study were not found to exceed the accomplishments of the other groups; and thereby imply that previous studies may well have had an inherent bias within them towards establishing the opposite. It is certainly a consideration.

Ultimately, this thesis has outlined many different directions for future research throughout Chapters 6-8 so they will not be repeated here. There are still many unanswered questions – that is the challenge.

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380

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Baby Signing websites

www.babysign.co.uk   www.babycentre.co.uk   www.babysigners.co.uk

www.babysigns.com   (Acredolo & Goodwyn)

http://www.bbc.co.uk/news/education-12192050

http://en.wikipedia.org/wiki/Sign_language_in_infants_and_toddlers)

www.itvbabysign.com

www.sign2me.com (Garcia)   http://www.smalltalklearning.com/research/studies.html

www.tinytalk.co.uk

http://www.literacytrust.org.uk/talk_to_your_baby/key_topics/1285_baby_signing

Bandura's Social Learning Theory

www.learning-theories.com/social-learning-theory-bandura.html

Government Policies and Initiatives for the Under 3s: Care and Learning for Children: Birth to Three (2005)

http://www.ltscotland.org.uk/Images/birth2three_tcm4-161671.pdf

Parent organisations

http://www.mumsnet.com/surveys/pressure-on-children-and-parents accessed 22nd March, 2011.

http://gizmodo.com/5532261/the-best-ipad-apps-for-babies-toddlers-and-sanity+loving-parents)

http://www.bbc.co.uk/news/education-17690875 Child's play not easy for modern parents, say experts. 13 April, 2012. Judith Burns.

Deaf children's charity

www.ndcs.org.uk

Feral children

"Secret of the Wild Child": PBS Airdate: March 4, 1997 available from

http://www.pbs.org/wgbh/nova/transcripts/2112gchild.html accessed 18 April, 2011.

Appendices

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UNIVERSITY OF
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PSYCHOLOGY

CONFIDENTIAL QUESTIONNAIRE: Background info

Please omit any question you do not wish to answer.

Participant no.   **Date:**

Background Info Questionnaire		Awards	Mother	Father
Questions about you				
1	Is your **highest** level of education…	**Secondary school**?	No qualifications		
			Standard Grades/GCSEs		
			Highers/A Levels		
		FE College?	City & Guilds/ NVQs/SVQs		
		HE/University?	Certificate		
			Diploma		
			BA/BSc		
			MA/MSc		
			PhD		
2.	If you are employed, how would you describe your **work**?		Full time parent		
			Manual non-skilled		
			Manual skilled		
			Clerical/administrative		
			Managerial/ professional		
			Unemployed		
3.	Do you smoke?	Details		**Mother**	**Father**
	Questions about your extended family			**Mother's family**	**Father's family**
4.	Does your extended family live **close** by?		We see them daily		
			We see them weekly		
			We see them monthly		
			We see them at holiday times only		
				Hours per week	
5.	If you work, how much time does your child stay with/at…		Grandparents/siblings		
			friends		
			careminder		
			Playgroup/nursery		

6.	Do you have any history of language impairment (e.g. dyslexia, speech apraxia, etc.) in the family	Details			**Mother's**	**Father's**
			Yes			
			No			
	Questions about your infant					
7.	Did/do you breastfeed your baby?			Yes		n/a
				No		n/a
8.	Has your infant had any prolonged illnesses during the 1st 12 months? (e.g. glue ear or other acute ear infections, etc.)	**Yes**			**No**	
		Any details given				
	Questions about immediate family					
9.	Do both parents live at home with your baby?	**Yes**			**No**	
10	What is the birth order of your child (involved in this study)?	1st child	2nd	3rd	4th	More
11	Are there half-siblings?	**Yes**			**No**	
		Any details given				
12	Is English the only language spoken at home?	**Yes**			**No** Any details	

Researcher: Lorraine Howard

Principal Supervisor: Dr Gwyneth Doherty-Sneddon

Appendix 2 Vocab Grid Checking Sheet   Date started:

Focus	Sign	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/ Food														
	apple														
	banana														
	grapes														
	orange														
	pear														
	peach														
	strawberry														
	plum														
	tomato														
	cucumber														
	broccoli														
	cauliflower														
	potato														
	mushroom														
	onion														
	peas														
	pepper														
	Baked beans														
	cheese														
	pasta														
	sausages														
	chips														
	rice														
	pizza														
	meat														
	Fish fingers														
	bread														
	yoghurt														
	Ice-cream														
	chocolate														
	sweet														
	biscuit														
	cake														

Focus	Sign	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/Food														
	butter														
	jam														
	honey														
	drink														
	water														
	milk														
	juice														
	A lot														
	all														
	more														
	finished														
	Full up														
	favourite														
	enough														
	eat														
	like														
	Don't like														
	Sit down														
	Stand up														
	hot														
	cold														
	messy														
	hungry														
	thirsty														
	Thank you														
	please														

Theme/ Play																		
ball																		
book																		
Car/truck																		
Blocks/bricks																		
Dolly/baby																		
teddy																		
catch																		
choose																		
dance																		
paint																		
push																		
Crash/fall down																		
wait																		
hide																		
again																		
more																		
finished																		
gone																		
duck																		
sheep																		
pig																		
cow																		
dog																		
cat																		
fish																		

Focus	Sign	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/clothes														
	dress														
	jumper														
	shirt/blouse														
	T-shirt														
	trousers														
	nappy														
	pants														
	vest														
	socks														
	tights														
	shoes														
	pyjamas														
	scarf														
	gloves														
	hat														
Focus	**Sign**	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/colours														
	colours														
	blue														
	black														
	brown														
	green														
	orange														
	pink														
	purple														
	red														
	yellow														
	white														

Focus	Sign	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/ adjectives														
	happy														
	sad														
	little														
	big														
	noisy														
	quiet														
	not well														

Focus	Sign	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/verbs														
	come														
	go														
	kick														
	look														
	jump														
	make														
	push														
	run														
	share														

Focus	Sign	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/getting ready														
	bath														
	shower														
	towel														
	wash														
	brush														
	poo														
	wee														
	sleepy														
	wide awake														
Focus	**Sign**	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/family														
	Mummy														
	Daddy														
	baby														
	Siblings' names														
	Grandma														
	Granda														
	auntie														
	uncle														
	cousin														
	dog														
	cat														
	fish														
	hamster														
	guinea pig														
	horse														
	mouse														
	rabbit														
	friend														
	girl														
	boy														

Focus	Sign	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/ transport														
	car														
	bus														
	train														
	boat														
	plane														
	lorry/truck														
	motorbike														
	bike														
Focus	**Sign**	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14
	Theme/places														
	home														
	outside														
	farm														
	shop														
	work														
	hospital														
	school														
Focus	**Theme/misc**	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14

Appendix 3

DVD of BS signs (cf. also Appendices 2, 4, 5)

Appendix 3b DVD – Baby Gesture

Sign	Time Sign Used	Sign	Time Sign Used
Mummy	1.30	A lot	11.57
Daddy	1.42	All gone	12.08
Papa	1.51	Number	12.21
Brother	1.58	Happy	12.35
Sister	2.10	Sad	12.49
Baby	2.24	Excited	13.00
Granny	2.42	Sleepy	13.13
Granda	2.53	Not well	13.30
Grampa	3.03	Gently	13.46
Auntie	3.08	I	14.01
Uncle	3.18	You	14.13
Cousin	3.30	We	14.21
Friend	3.42	She	14.33
Cat	4.00	He	14.43
Dog	4.12	It	14.51
Goldfish	4.25	They	15.00
Budgie	4.40	My	15.15
Parrot	4.55	Mine	15.28
Horse	5.10	Your	15.38
Hamster	5.25	Our	15.49
Guinea Pig	5.39	Her	16.01
Mouse	5.52	His	16.10
Rabbit	6.06	Its	16.20
Homework	6.20	Theirs	16.28
School	6.32	**GETTING DRESSED**	
Camp	6.45	Towel	17.14
Holiday	7.01	Potty	17.30
See	7.20	Clothes	17.45
Look	7.30	Pyjamas	17.58
Up	7.42	Vest	18.14
Down	7.52	Nappy	18.27
Fight	8.03	Pants	18.45
Share	8.16	Socks	18.57

Want	8.31	Tights	19.09
Like	8.44	T-shirt	19.21
Go to	8.56	Shirt/blouse	19.37
Come	9.08	Jumper	19.52
Stop	9.17	Trousers	20.05
Home	9.28	Dress	20.18
At work	9.40	Skirt	20.30
In the car	9.51	Shoes	20.43
At the hospital	10.06	Boots/wellies	20.56
At Granny's	10.25	Hat	21.13
At school	10.36	Cap	21.24
In the field	10.47	Scarf	21.35
On the farm	11.01	Gloves	21.48
In the plane	11.14	Coat	22.02
On the bus	11.28	Jacket	22.17
On the train	11.43	Umbrella	22.28
Bag	22.40	Mushroom	34.07
Wake up	22.53	Cauliflower	34.21
Sleep	23.04	Broccoli	34.36
Change	23.18	Pasta	34.48
Wash face	23.32	Rice	35.03
Bath	23.46	Potato	35.16
Shower	23.56	Peas	35.30
Shampoo	24.08	Bread	35.40
Brush teeth	24.23	Butter	35.52
Brush hair	24.37	Jam	36.06
Put on	24.50	Honey	36.17
Get out	25.02	Cake	36.31
Poo	25.17	Biscuit	36.43
Wee	25.30	Chocolate	36.55
Outside	25.38	Sweet	37.06
Really	25.51	Ice cream	37.16
A little	26.01	Milk	37.28
None	26.13	Yoghurt	37.43
Wide awake	26.27	Juice	37.55
Sleepy	26.38	Water	38.08
Wet	26.50	Mess	38.21
Dry	27.02	Plate	38.35

Hot	27.12	Bowl	38.45
Cold	27.26	Eat	38.56
Hungry	27.38	Drink	39.07
Ready	27.50	Stir	39.18
Clean	28.03	Mash	39.31
Dirty	28.16	Slice/cut	39.44
Sore	28.28	Chop	39.56
Thirsty	28.41	Spread	40.08
No	28.50	Lick	40.19
Yes	29.05	Spill	40.28
FOOD		Wipe up	40.39
Orange	30.13	Find	40.52
Grapes	30.25	Cook	41.06
Peach	30.43	Get (retrieve)	41.19
Pear	30.58	Give	41.30
Plum	31.10	Don't	41.41
Strawberry	31.23	Get down	41.50
Cheese	31.38	Sit down	42.01
Meat	31.53	Stand up	42.12
Sausages	32.07	In the fridge	42.23
Baked beans	32.21	In the cupboard	42.35
Chips	32.35	On the table	42.46
Fish fingers	32.48	In the kitchen	43.00
Pizza	33.06	In the bowl	43.13
Tomato	33.21	In the bag	43.24
Cucumber	33.33	In the freezer	43.35
Onion	33.45	More	43.47
Pepper	33.55	Enough	43.57
Sour	44.09	Calm down	54.29
Full up	44.20	Tidy up	54.38
Favourite	44.30	Bedroom	54.50
Thank you	44.42	Kitchen	55.04
Please	44.52	Sitting room	55.16
PLAYTIME		All	55.26
Park	45.33	Slowly	55.36
Swings	45.44	Noisy/loud	55.47
Slide	45.58	Quiet	56.00
Roundabout	46.12	Finished	56.12

Birds	46.26	Soft	56.22
Ducks	46.40	Cuddly	56.31
Trees	46.50	Big	56.45
Swimming pool	47.02	Small	56.53
Wings	47.20	Gentle	57.00
Rings	47.35	Funny	57.10
Toys	47.48	Scary	57.19
Dolly	48.04	Colours	57.29
Teddy	48.19	Red	57.41
Panda	48.31	Blue	57.52
Dinosaur	48.45	Yellow	58.02
Crocodile	49.00	Orange	58.12
Book	49.12	Purple	58.23
Ball	49.24	Green	58.34
Bricks	49.36	Black	58.42
Ring (hoop)	49.53	White	58.53
Car	50.06	Pink	59.03
Bus	50.17	Brown	59.15
Train	50.30	Striped	59.27
Fire engine	50.40	Spotty	59.37
Rocket	50.51	Flowery	59.50
Flashing lights	51.02	**MY BODY**	
Man	51.15	Head	1 00.28
Girl	51.22	Ears	1 00.40
Boy	51.30	Eyes	1 00.50
Play	51.42	Nose	1 00.58
Push	51.52	Mouth	1 01.06
Run	52.02	Teeth	1 01.15
Jump	52.16	Tongue	1 01.23
Splash	52.25	Arm	1 01.32
Up	52.34	Hand	1 01.43
Kick	52.44	Fingers	1 01.53
Paint	52.54	Tummy	1 02.04
Make	53.07	Bottom	1 02.13
Throw	53.18	Leg	1 02.23
Catch	53.26	Knee	1 02.35
Take turns	53.37	Foot	1 02.48
Dance	53.50	Glasses	1 03.00

Sing	54.04	Bump	1 03.12
Choose	54.17	Cut	1 03.23
Fall	1 03.30		
Cry	1 03.41		
Wait	1 03.52		
Break	1 04.02		
Sick	1 04.11		
Bed	1 04.21		
Mummy's knee	1 04.34		
Car	1 04.43		
Ambulance	1 04.55		
Doctors	1 05.06		
Hospital	1 05.25		
Outside	1 05.36		
Garden	1 05.45		
Really	1 05.57		
Better	1 06.07		
OK	1 06.17		
Gone	1 06.25		
QUESTIONS			
Who	1 06.52		
What	1 07.00		
Why	1 07.07		
Where	1 07.17		
When	1 07.27		
Which	1 07.36		
How	1 07.47		

Appendix 4a Photo Stills

<u>**Activities**</u>

<u>**Clothes**</u>

Colours

Descriptions

Doing words

<u>Foods</u>

Getting ready

My family

My Family

Getting Dressed
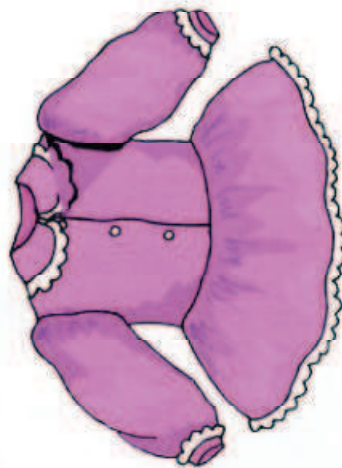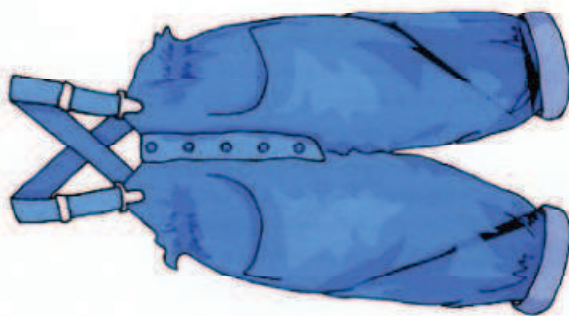
Playtime

Food

My Body

Appendix 4c Photo Stills: My Family

→

Auntie

Baby

Brother

Cousin

Mummy

427

Daddy

Grandma

→

Dog

→

Granda

428

Sister

  →

Uncle

$\longrightarrow$

Birds

Budgie

Horse

$\longrightarrow$

Goldfish

Guinea pig
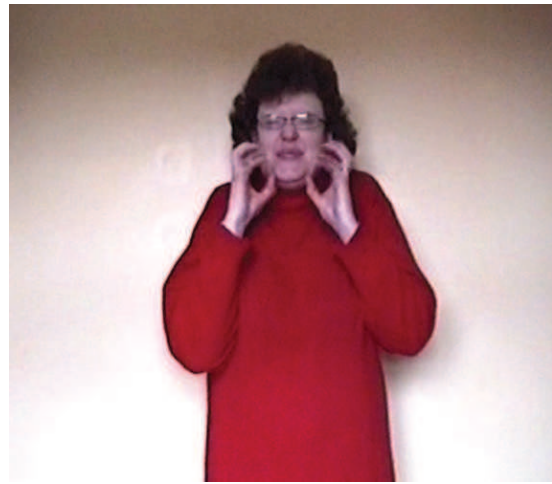
Hamster

Mouse   **Parrot**

$\rightarrow$

Rabbit

$\rightarrow$

Cat

432

Appendix 4e Photo Stills: Getting Ready

 →

Towel

 →

Bath

 →

Sleepy

433

Poo

→

Wee

Clothes

Dress

$\longrightarrow$

Jumper

Pants

Shirt

→

Pyjamas

→

Vest

→

Nappy

436

$\rightarrow$

Socks

T-shirt

$\rightarrow$

Trousers

 $\rightarrow$

Shoes

 $\rightarrow$

Scarf

 $\rightarrow$

Gloves

438

Appendix 4g Photo Stills: Activities

Again

Ambulance

Ball (1)

$\rightarrow$

Ball (2)

Ball (3)

$\rightarrow$

Ball (4)

439

Book (1) → Book (2)

Book (3)

Car

Bricks →

440

$\rightarrow$

Catch

Choose

Dance (1)

Dance (2)

$\rightarrow$

Dance (3)

441

Dinosaur

Flower

$\rightarrow$

Dolly

$\rightarrow$

Duck

442

$\longrightarrow$

Flashing lights

$\longrightarrow$
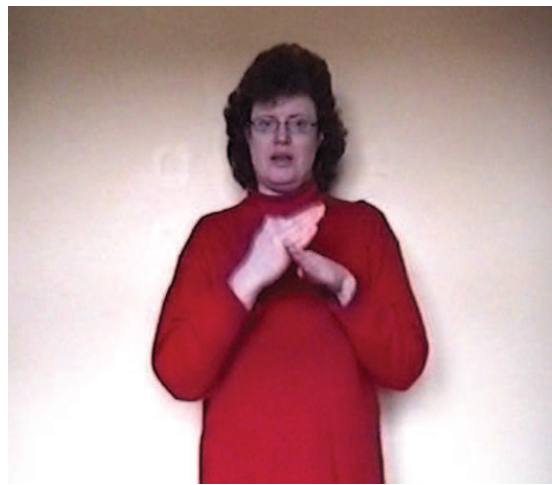
Homework

My turn

Panda

443

→

Paint

→

Play

Potty   **Park**

444

$\longrightarrow$

Swings

$\longrightarrow$

Tree
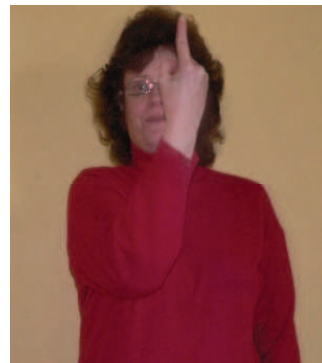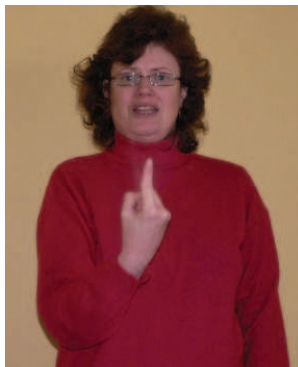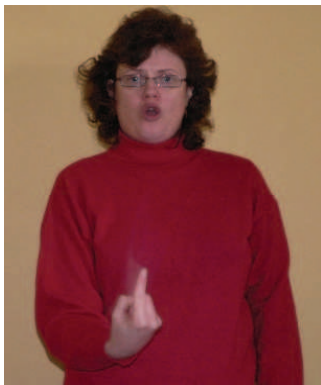
Rocket

Fire engine

→

Outside

Teddy

Appendix 4h Photo Stills: Doing Words

$\rightarrow$

Come

Fight

Go

Kick

Look

447

$\rightarrow$

Jump

Jump

$\rightarrow$

Make

→

Push

→

Run

→

Share

449

Big (A)

Big (B)

$\rightarrow$

Clean

Cuddly

Dirty

$\rightarrow$

Excited

Frightened

Gently

$\rightarrow$

Funny

→

Happy

Little (A)

Little (B)

Noisy

Sad

452

$\rightarrow$

Not well

$\rightarrow$

Quiet

→

Apple

→

Baked Beans

→

Banana

Biscuit

Cake

 →

Bread

 →
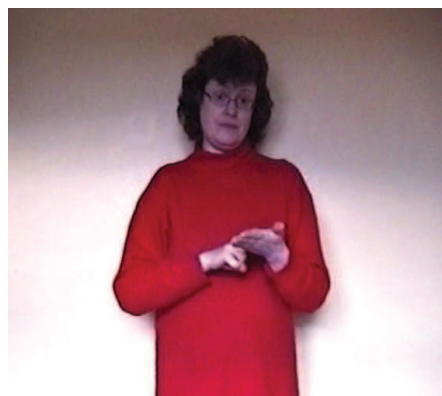
Butter
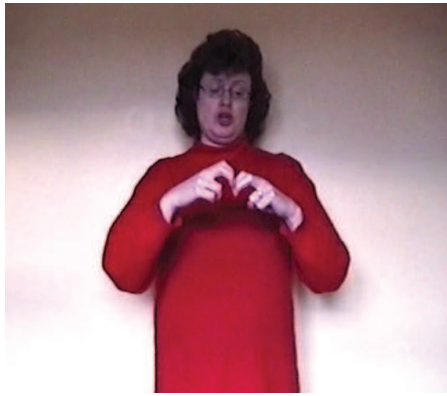
1

→
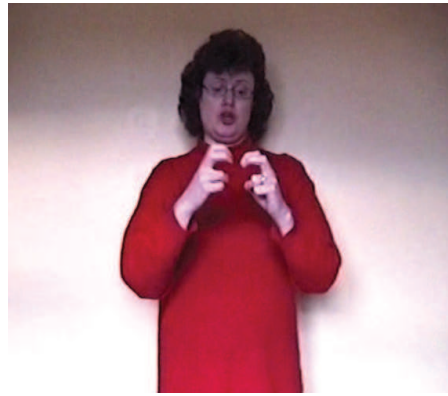
2

3

→

4

Cauliflower
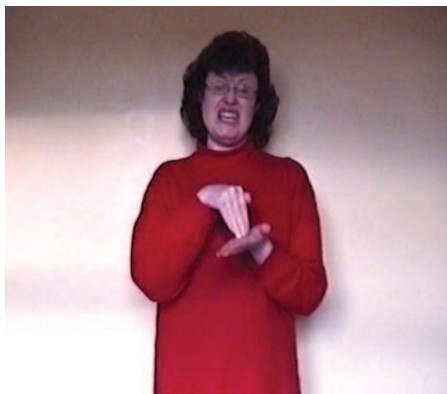
Cheese

Chocolate

Cucumber

Drink

$\rightarrow$

Fish fingers

$\rightarrow$

Grapes

457

Jam

Juice

→

Meat

→

Milk

458

Mushroom

Onion

→

Peach

→

Peas

→

Pepper

→

Pizza

→

Plum

→
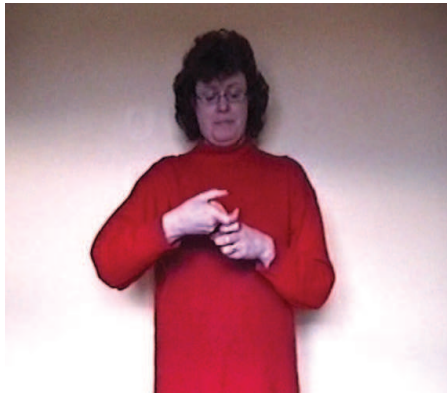
Potato

Pear

Rice

→
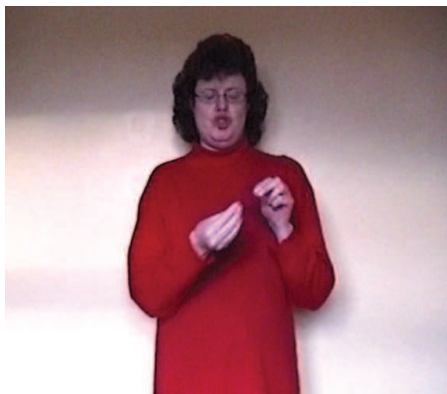
Strawberry

Water
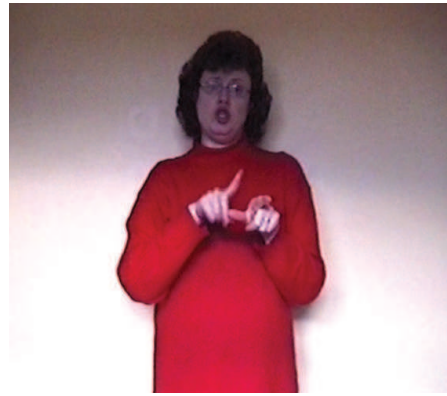
Yoghurt

$\rightarrow$

A lot

$\rightarrow$

All

→

All gone

→
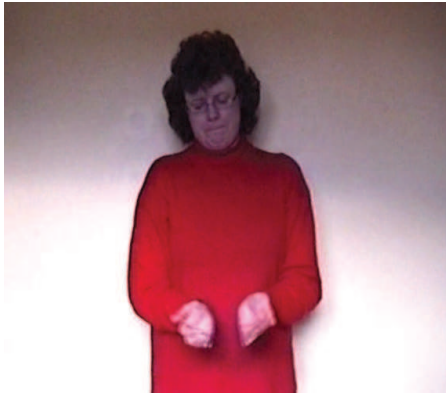
Bowl

→

Chop

Food

Eat

→

Favourite

→

Finished

Kitchen

Mash

Like

More

→

Messy

Slice

Spread

Stir

Thirsty

$\rightarrow$

Orange

Sausages

 →
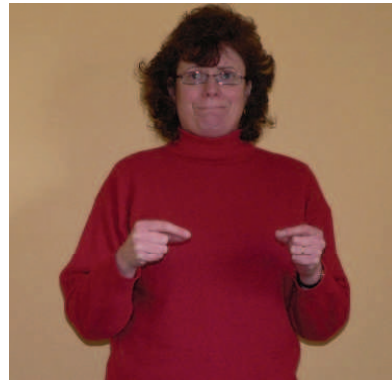
Chips

 →

Tomato A

→

Tomato B

Broccoli

→
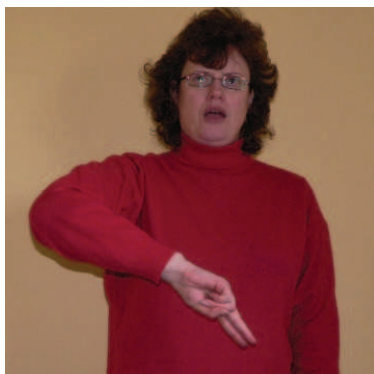
Pasta

 →

Honey

 →

Sweet

 →

Ice-cream

 →

Spill

 →

Cook

 →

Want

$\rightarrow$

Don't Like

$\rightarrow$

Sit down

$\rightarrow$

Stand Up

Freezer
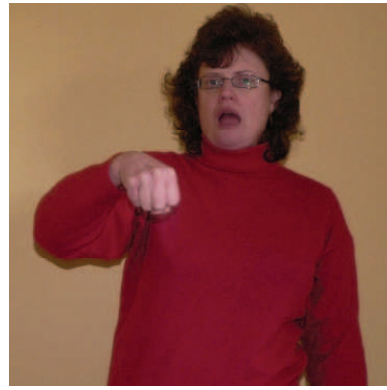
Bag

 →
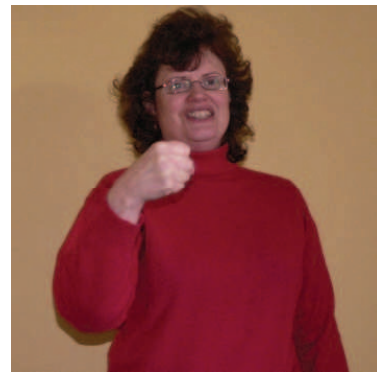
Fridge

 →
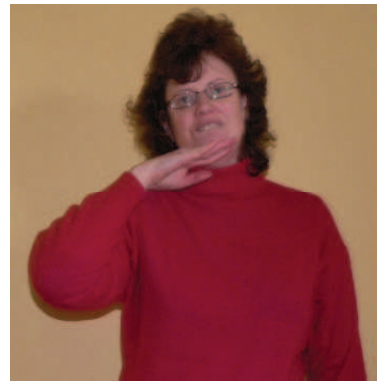
Enough

→

Full Up

→

Hot

→

Cold

473

$\rightarrow$

Please

$\rightarrow$

Thank you

$\rightarrow$

Hungry

$\rightarrow$

At Granny's

$\rightarrow$

At the hospital

$\rightarrow$
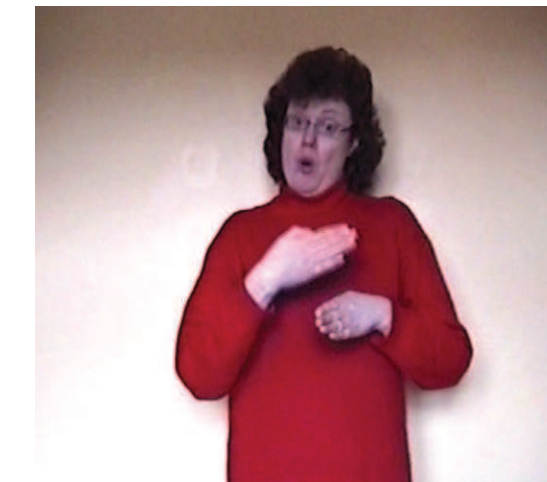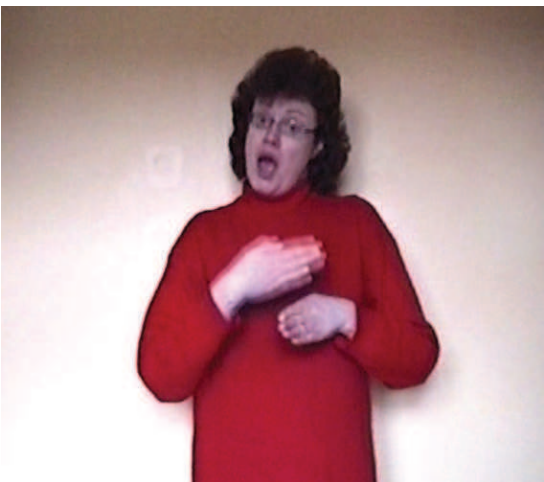
At work

Bedroom

Camp

Field (1)

→

Field (2)

Field (3)

→

Field (4)

476
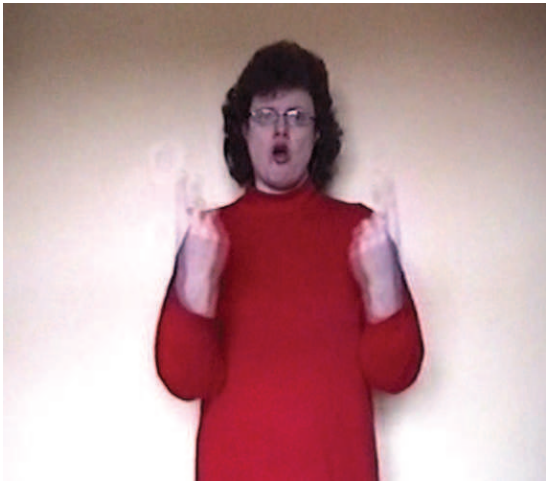
Holiday

Home

In the car

There

$\longrightarrow$

On the bus

477

1 $\rightarrow$ **2**

On the farm

3

$\rightarrow$

On the plane

478

1 → **2**

On the train

School

→

Boy

Friend

Girl

He

His

Man

She

$\rightarrow$

Crocodile

Appendix 4n Photo Stills: Colours

Colour

Blue
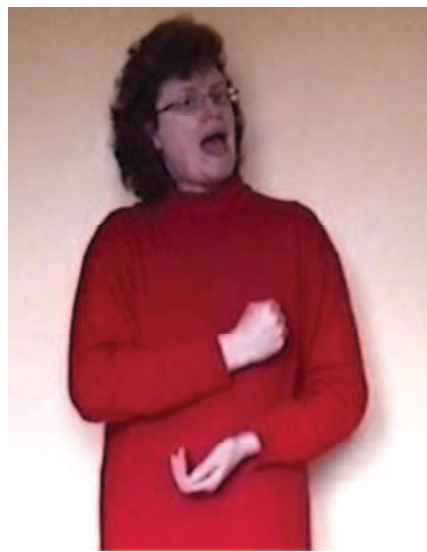
Black

Brown

Green

Orange

Pink

Purple
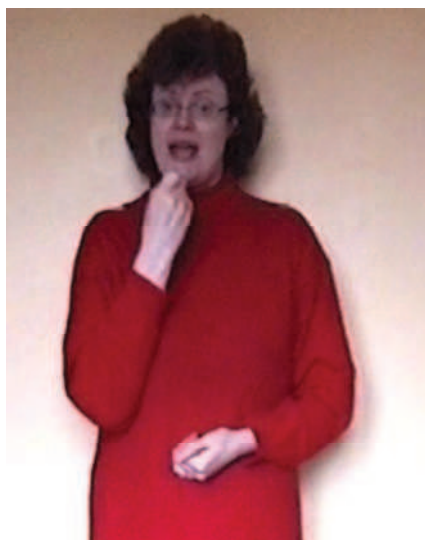
Red

Yellow
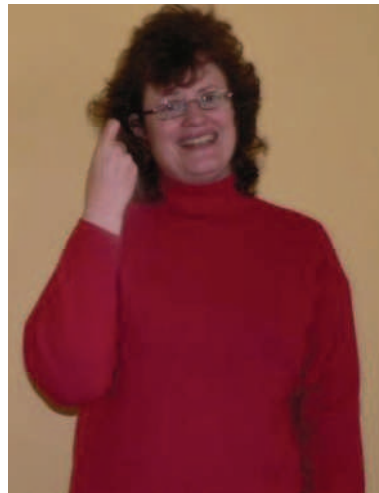
White

Appendix 5: Early Language Learning & Parentese

When talking to their children many parents use a form of language called 'Parentese'. Below is an explanation of what this is, why it is used, & what affects parents in whether they use it or not.

What is 'parentese'?

This is a form of 'baby talk' which differs from typical adult speech in several ways:

> It is child-centred, focused on the child's points of interest.
>
> It tends to involve simpler, shorter sentences. Often these are repeated and are less rapid than those typically used in adult discourse.
>
> The tone tends to be more highly-pitched but also more melodic – with rhythmic shifts between high & low. It can sound almost song-like. Vowels are at times elongated: e.g. 'hors**ey**', 'sweet**ie**', 'all g**o**ne'. There tends to be strong eye contact between parent & child when it is used. Sometimes words such as 'ready', 'again', 'wait', etc. can be used to cue the child into the discourse that is to follow.
>
> There is often strong body language that accompanies 'parentese'.

Why is it used?

'Parentese' is an effective way of getting your baby's attention. As there tends to be more eye contact, the infant also becomes aware of the body language and facial expressions that accompany such speech. This provides them with much more information and thereby helps them to pick up more of the meaning of the utterance itself. By looking at your gaze it can help develop joint attention, especially where other objects in the environment are involved.

Moreover, it helps the infant bond with you and be aware of much more of the social and emotional aspects to each interaction. On the basis of these interactions with you, your child will have a platform for developing other relationships and communication with others less familiar to them.

'Parentese' also builds on the child's understanding and need to communicate with you. Different patterns – in terms of speech sounds, how words combine, and the meanings they have are all reflected in a child-friendly way. In time they will start to imitate all of these patterns – for example, imitating sound patterns will elicit a positive reaction from you which goes on to reinforce the positive value of communicating to each other. You might even scaffold this response by extending or expanding on it. This gives them more linked information to develop their understanding of the meanings of what you say and the relationships between these ideas.

Appendix 5: Early Language Learning & Parentese

<u>Does this mean that everyone uses 'parentese'?</u>

There are cultural differences in how parents talk to their children. Sometimes this relates to the image one has of a child: for example, are they a blank slate, are they small adults, how much depends on their experiences and how much on their innate temperament, etc. This means that culturally there are different viewpoints. It is important to acknowledge these – and to discuss the different approaches possible.

It is also important to understand how first languages are structured if this is radically different from any other being used with the child. In this way, it is feasible to present 'parentese' in as natural a way as possible without distorting the patterns of the first language itself.

<u>Good ways to use 'parentese'</u>

At bath-time, during meals, during play, at bedtime, when sharing books, songs, or when outdoors – walking, at the shops, etc.

<u>Who can use 'parentese'?</u>

The whole family, friends, caregivers, etc. If you identify particular things your child enjoys – like feeding the ducks – make sure you involve everyone in the loop. As your child hears these patterns with different people it will reinforce their understanding & the likelihood of their sharing their thoughts with you.

Appendix 6a: ENV Group Information

Early Language Learning and the ENV Group

The ENV group revolves completely round the idea of intentionality and language development. It proposes that language develops alongside other cognitive functions - including development in motor skills (e.g. hand/eye coordination), attention and perception, categorization and working memory. Through embodied mind, direct experiences that an infant has of action events, including cause and effect situations (I push sth and it falls down, I bang on sth and it sometimes makes a noise but sometimes it doesn't) builds up a representation in memory of what happens. More importantly this also creates a memory of the infant's own role within that event and the result they effected from such action.

The theory goes that a child will be motivated to communicate these thoughts to significant others to:-

a) highlight that the act occurred
b) check that the significant other noticed, and
c) gain additional understanding or confirmation of the event.

This communication might take the form of:-

eye contact

pointing

vocalising whilst looking at the object

Different temperaments may give rise to different types of communication. On the other hand, the infant might try different ways of communicating in relation to the degree of success they have with each method (i.e. have they been able to successfully communicate the meaning of their utterance?).

It is conceivable that language and several other cognitive skills are emergent properties dependent on each other for progress rather than independent entities. For example, theory of mind and language are viewed as closely related -but we're still unsure if one progresses from the other or if another element entirely is responsible for them both. If intentionality develops more quickly from focusing on actions, especially the direct actions the infant employs, this might have an effect on working memory, language, executive function...we're not sure.

So...

Infant actions - with simultaneous talk about what they are doing in situ, repetition of these actions, (whether as part of games, or of songs), become crucial.

Suggestions:

Building blocks and knocking them down (with commentary especially on what the child is doing)

Putting cups inside each other

Putting shapes into a sorter

Appendix 6a: ENV Group Information

Hiding and playing peek-a-boo

Pouring water from a beaker in the bath and re-filling it

Throwing a ball and returning it

Doing hand and foot prints on paper

All give a multi-sensory feel to specific actions. Listening, doing, looking at, and touching become important cues to the acts taking place. By having eye contact during these actions, the element of speech act becomes more evident to your child and they begin to see the importance of communicating to you – again in situ.

This is the theory…by keeping note of what happens we can see whether the vocab or gestural communication your child develops has been influenced by the actions we've focused on – or if the motivations lie elsewhere.

We need to watch this space!!!

I hope I've explained this clearly. Please do ask me more questions if you're unsure.

Appendix 6b: ENV Group – Possible Activities

Type of activity	Materials used	Actions involved	Relevant language	Child's response	Date
e.g. Building up bricks	Blocks/bricks	Construction, hand/eye coordination, spatial awareness, patience, (turn-taking), motor control	Up, wait, more, again, push, crash, wobbly, fall down, bye-bye	Vocalization, pointing, natural gesture, eye contact	
Inserting cups into each other					
Posting letters					
Hiding self, objects, other people for peek-a-boo – e.g. when getting dressed					
Doing hand or foot prints					
Lifting flaps in books					
Blowing bubbles in the bath					
Pouring water in & out of cups					

Appendix 7a: **Training Plans**

Themes	Age Groups	Targeted skills	Materials	Vocab	Syntax Elements
Getting Dressed	6-12 mths 9-12 mths 12- 18 mths	Visual/ auditory attention- Tactile exploratory play Manipulative exploratory — Solitary imaginative — Parallel play — Shared social &	Doll Clothing items, brush, comb	Cf sep sht	Preps: on/in/off Verbs: imperatives, Present tenses: put, have, get
Bathtime	6-12 mths 9-12 mths 12- 18 mths	Visual/ auditory attention - Tactile exploratory play Manipulative exploratory - Solitary imaginative — Parallel play - Shared social &	Doll Bath Bathtime accessories: sponge, soap, towel, mat	Cf sep sht	Preps: on/in/off/out Verbs: imperatives, Present tenses: put, splash, sit, stand, jump
Mealtime	6-12 mths 9-12 mths 12- 18 mths	Visual/ auditory attention - Tactile exploratory play Manipulative exploratory - Solitary imaginative — Constructive Parallel play - Shared social & imaginative	Play food, drink, cutlery & crockery	Enough, Finished, More Some	Preps: on/in/off Eat, drink, pour, cut, mash, stir
Going out	6-12 mths 9-12 mths 12- 18 mths	Visual/ auditory attention - Tactile exploratory play Manipulative exploratory - Solitary imaginative — Constructive — Parallel play - Shared social & imaginative -		Cf sep sht Quick Hurry Wet Sunny Hot Cold	Preps: on/in/off/out Interrogatives: where, who, when, how, which Vbs: visit, shop, swim, play, school, work, nursery

Sharing books	6-12 mths	Visual/ auditory attention - Tactile exploratory play	Pop-ups, lift- the-flap, cloth, plastic, glove, board, paper	Cf sep sht	Preps: on/in/off/out/behind/in front/under
	9-12 mths	Manipulative exploratory - Solitary imaginative −			Interrogatives: where, who, when, how, which
	12- 18 mths	Parallel play - Shared social &			Share, read, find, hide
Playtime	6-12 mths	Visual/ auditory attention - Tactile exploratory play	Bubbles Windmills Peek-a-boo balloons Doll(s)	Cf sep sht	Cf sep sht
	9-12 mths	Manipulative exploratory - Solitary imaginative − Constructive −	Stacking cubes/rings Jack-in-the-box Farm		
	12- 18 mths	Parallel play - Shared social & imaginative -	Postbox Bus truck Rocket Puzzles (inset, etc) Masks Ball(s) Dominoes Match cards Puppets Hats & dressing up		
Singing	6-12 mths	Visual/ auditory attention − Rhythm building	CDs Audio tapes Puppets Instruments Party blowers Train whistles Action songs	Cf sep sht	Cf sep sht
	9-12 mths	Solitary imaginative − Constructive − Shared social & imaginative -			
	12- 18 mths				
Cooking	15-18 mths	Visual/ auditory attention − Manipulative exploratory - Constructive − Shared social & imaginative -	Pots Bowls Spoons Paper cases	Cf sep sht	Cf sep sht

Appendix 7b: Teaching Protocols: Introductory Sessions 1-4

<u>Materials</u>
Soft cubes
Doll
Sheet
Brush
Potty
Soft book
Lift the flap book

<u>Activities</u>
Scrunching cubes
Ringing bell in cube
Building cubes up
Knocking cubes down
Throwing/rolling cubes to each other

Taking cubes out of bag
Placing them back in the bag

Putting other things in the bag
Doing & undoing the poppers

Putting dolly to bed
Waking dolly up
Brushing dolly's hair
Sitting dolly on potty

Peek-a-boo (with adult, with dolly, with sibling)

<u>Vocab/signs</u>

Hiya/hello	Bye-bye/Ta-ta	What's this ?
Where's he/she/it gone?	Here he/she/it is	Baby
Pop	Crash	Bee
All gone	Ready	Moo
Again	Catch it!	Oink
Up – up – up	Oh-oh	Cheep
Wait	Stop	Baa
Sleepy	Night-night	Quack
Wake up!	Poo/pee-pee/wee-wee	Woof
Mummy do it	Dad/Papa/Daddy do it	Miaow

Appendix 7c: Evaluating teaching input - BS

1. Aim to introduce a certain number of gestures/words at a time.
2. Look at how the children begin to use these themselves: along with pointing? With voice? Who/what do they look at when using them – object or parent?
3. What composition of gestures/words do they use: labels? Requests? Politeness routines? Displays of knowledge? Displays of language socialization?
4. Are there any examples of innovative usage? When do these occur?
5. Is there any evidence of enriched gestures being produced in combination (with voice, exact word, other enriched gesture)?
6. Is there any evidence of influence on word order for the gesturing children?
7. Do you see your child using enriched gestures used with all people, only close family, close family and friends, extended family?
8. Do the types of enriched gesture differ according to the interlocutor?
9. What are the attitudes of significant others in your close circle to the use of enriched gestures?
10. What, if any, do you see as benefits of enriched gesturing for your child in your family context?
11. Do you see a change in how you or your child is using the enriched gestures?
12. Are there particular times of the day when your child uses the enriched gestures more or less (e.g. on waking up, going to bed, when tired, ill, or when playing, eating, with other children, etc.?)

Enriched gesture	1st appearance	Context	Prompted or self-generated?	Type	In combination?	With whom?	No. of times used	Still in use or now in verbal format only?
e.g. 'cat'		In garden		label	pointing	Mother		
'more'		lunchtime		request		Father		
'shoe'		In presence of researcher		Knowledge-display exchange		Mother		

Appendix 7d: Language and Play Sessions – Proposed Structure

Language for Daily Routines

'Getting Dressed'

Nouns	Verbs	Locations	Quantifiers	Qualifiers	Pronouns	Possessives
Towel	Wake up	Outside	Really/very	Wide	I	My
Potty	Sleep	Home	A little	awake	You	Mine
Mummy	Change		none	Sleepy	We	You
Daddy	Wash (face)			Wet	They	Yours
Baby	Bath			Dry	Us	Our(s)
	Shower			Hot	Them	Their(s)
Clothes:	Shampoo			Cold		
pyjamas	(hair)			Hungry		
Vest	Brush (teeth)			Ready		
Nappy	Brush (hair)			Clean		
Pants	Put on			Dirty		
Socks	(clothes)			Sore/not		
Tights	Get out (of			well		
T-shirt	pram/bath)			Thirsty		
Shirt/blouse	Poo					
Jumper	Wee			No		
Trousers				Yes		
Dress						
Skirt						
Shoes						
Boots						
Wellies						
Hat						
Cap						
Scarf						
Gloves						
Coat						
Anorak/Jacket						
Umbrella						
Bag						

Activites

1. Child's own dressing time or play at dressing up. Have bag of different items to choose from. Discuss them as we take them out one by one. Adult/parent/child/or doll wears the different items. Can play 'Peek-a-boo' when putting them on and taking them off.

2. Allow child to brush adult's hair, or doll's hair. Can give doll a bath/or wash doll's face.

3. Put doll on potty. Talk about wees and poos.

4. Brush doll's teeth.

5. Read 'Getting Ready'

6. Make sock puppets.

Songs
1. This is the way we brush our teeth, etc.

Adapted from http://www.preschooleducation.com/sclothes.shtml

2. Boot Prints added 12-10-01 Original Author Unknown
Submitted by: Beverly A. Meyer

Sung to: "This Old Man"

Here's one foot, here are two
Both are wearing (lovely) shoes
So you stand up, turn around,
Dance across the floor,
That's what these new shoes are for!

3. Let's Put On Our Socks added 9-10-01 Original Author Unknown

Sung to: "Hickory, Dickory, Dock"

Hickory, dickory, dock.
Let's put on our socks.
We'll walk around,
Without a sound,
When we put on our socks.

Repeat: slide, tiptoe etc.

4. Getting Dressed added 1-04-01 Original Author Unknown
Sung to: "The Farmer in the Dell"

We're getting dressed right now
We're getting dressed right now.
Hi-ho, I'm growing-o,
We're getting dressed right now.

Let's put my nappy on,
Let's put my nappy on.
Hi-ho, I'm growing-o,
Let's put my nappy on.

Additional second verses:
Let's button up my shirt.
Let's put on my jeans.
Let's put on my socks.
Let's put on my shoes.

Now look at me all dressed,
Now look at me all dressed.
Hi-ho, I'm growing-o,
Now look at me all dressed

Appendix 7e: My Body

Nouns	Verbs	Locations	Quantifiers	Qualifiers	Pronouns	Possessives
Head	Bump/Hurt	Bed	Really/a lot	Sore	I	Mine
Ears	Cut	Knee	Better	Hot	Me	My
Eyes	Fall	(Mummy's)	Ok	Cold	You	Your
Nose	Up	Car	Finished/Gone			
Mouth	Down	Ambulance				
Teeth	Cry	Doctor's				
Tongue	Stop	Hospital				
Arm	Wait	Outside				
Hand	Break	Garden				
Fingers	Sick					
Tummy						
Bottom						
Leg						
Knee						
Foot						
Glasses						

Activities

1. Putting plasters or bandages on toys.
2. Playing doctors and nurses (pretending to take teddy's temperature, carrying toys in the ambulance, etc).
3. Sticking parts of the face/ body onto a magnetic or laminated sheet.
4. Blowing bubbles.

Songs

1. One finger, one thumb keep moving.
2. Miss Polly had a dolly.
3. Five little monkeys jumping on the bed.

Appendix 7f: Playtime

Nouns	Verbs	Locations	Quantifiers	Qualifiers	Pronouns	Possessives
Park	Play	Home	More/Again	Noisy/loud	I	Mine
Swings	Push	Bedroom	All	Quiet	Me	Yours
Slide	Stop	Kitchen	Gently	Finished	You	Theirs
Roundabout	Run	Sitting	Slowly	Soft	They	
Birds	Jump	room		Cuddly	Them	
Ducks				Big/small	Us	
Trees				Gentle	We	
				Funny		
Swimming				Scary		
pool				Happy		
Wings	Splash			Favourite		
Ring	Up					
	Kick					
Toys						
Dolly	Paint					
Teddy	Make			Colours		
Panda	Throw			Red		
Dog	Kick			Blue		
Dinosaur	Catch			Yellow		
Crocodile	Take turns			Orange		
Book	Share			Purple		
Ball	Dance			Green		
Bricks	Sing			Black		
Rings	Like			White		
Car	Choose			Pink		
Bus	Calm			Brown		
Train	down			Striped		
Fire engine	Tidy up			Spotty		
Rocket				Flowery		
Flashing						
lights						
Man						
Girl						
Boy						
Mess						

Activities

1. Building up the bricks and knocking them down.
2. Stacking the rings, and rolling them across the floor.
3. Putting dolly/teddy/panda, etc. to bed/feeding them/hiding them.
4. Pretend play with the fire engine, car, train, etc.
5. Reading a Thomas story.

Songs

1. Round and round the garden.
2. This little piggy went to market
3. Three little monkeys jumping on the bed.
4. How much is that doggie in the window?
5. Never smile at a crocodile.

Appendix 7g: Teaching Protocols: Rhymes and Songs (Animals and Counting)

Animal Songs

Little Miss Muffet	Kookaburra
Little Bo Peep	Hickory Dickory Dock
Five Little Ducks	Five little monkeys
One, Two, Three, Four, Five	Down in the Jungle
Five Green and Speckled Frogs	Baa Baa Black Sheep
Mary Had a Little Lamb	Never Smile at a Crocodile!
Old Mother Hubbard	Incy Wincy Spider
Ladybird, Ladybird	

Counting songs (older age range)

This Old Man	Ten in the Bed
Five little monkeys	Ten Green Bottles
One, Two, Three, Four, Five	

Appendix 7h: Teaching Protocols: Food

Nouns	Verbs	Location	Quantifiers	Qualifiers	Pronouns	Possessives
Banana Apple Orange Grapes Peach Pear Plum Strawberry Cheese Meat Sausages Baked beans Chips Fish fingers Pizza Tomato Cucumber Onion Pepper Mushroom Cauliflower Broccoli Pasta Rice Potato Peas Bread Butter/marg Jam Honey Cake Biscuit Chocolate Sweet Ice cream Milk Yoghurt Juice water Mess Plate Bowl Cup Spoon Fork Knife Pan	Eat Drink Stir/mix Mash Slice/cut Chop Spread Lick Spill Wipe up Find Cook Get Give Like Want Don't want/like Come Get down	In the fridge In the cupboard On the table In the kitchen In the bowl In the bag In the freezer	All gone More Enough	Dirty Clean Messy Sour Sweet Hungry Thirsty Full up Hot Cold Favourite	I You We She He It They	My Mine Your Our Her His Its Theirs

503

Lid/top Chair Table Please Thank you						

Food songs

Ten Fat Sausages

Five Currant Buns

Pat-a-cake

Chick, Chick, Chick, Chick , Chicken

Fiona's Diary

...............'s Diary

Month:............... Year:...............

Study Week	Date: 1st time gesture used	Context – who was there, where, with what?	What did you do when using this word/sign (e.g. also point/show/give)?	What did your child do (point/vocalise/copy hand movement/shape, etc.?)	Used again? Same/different context Same/different person?	Used on its own/with voice/with spoken word/with another gesture?	Has your child started to use this word for him/herself?
	23/01/09	Playing Peekaboo	Also pointed	Copied Mum/Dad	Later did same with Granny	No words – but vocalising	Yes from 10/05/09

..............'s Diary   Month:.................. Year:...............

Study Week	Date: 1st time proto-word used	Context – who was there, where, with what?	What did you do when using this word (e.g. also point/show/give)?	What did your child do (point/vocalise/copy?)	Used again? Same/different context Same/different person?	Used on its own/with voice/with spoken word/with another gesture?	Has your child started to use this word for him/herself?
	23/01/09	Playing Peekaboo	Pointed to cloth	Copied Mum/Dad	Later did same with Granny	Pointing at hiding cloth	Yes from 07/03/09

Appendix 8d: ENV Parent Diary

...............'s Diary

Month:................. Year:.................

Study Week	Date: 1st time gesture/vocalization/ (proto-)word/ pointing used	Context – who was there, where, with what?	What did you do when using this word/sign (e.g. point/show/ give)?	What did your child do (point/vocalise/ copy you?)	Used again? Same/different context Same/different person?	Used on its own/with voice/with spoken word/with another gesture?	Has your child started to use this word for him/herself?
	23/01/09	Playing Peekaboo	Also pointed	Copied Mum/Dad	Later did same with Granny	No words – but vocalising	Yes from 09/04/09

Appendix 9: MCDI Comparison of Categories from Baseline to TP1 (Comprehension Percentages) and from TP2 to TP3 (Production Percentages) across Groups (BS *N* = 14; EV *N* = 11; ENV *N* = 10; and Non-Intervention Group *N* = 12. Total *N* = 47)

Appendix 9: MCDI Comparison of Categories from Baseline to TP1 (Comprehension Percentages) and from TP2 to TP3 (Production Percentages) across Groups (BS *N* = 14; EV *N* = 11; ENV *N* = 10; and Non-intervention Group *N* = 12. Total *N* = 47

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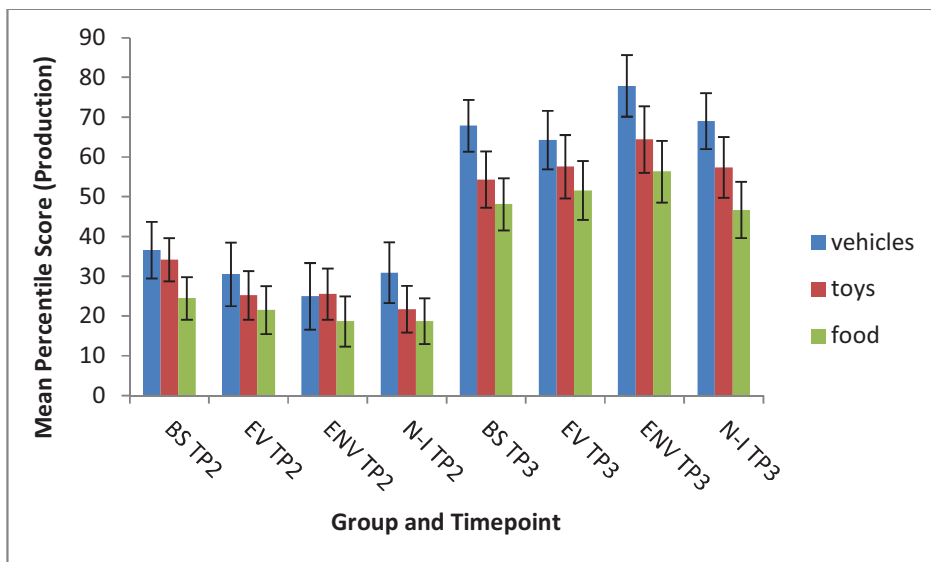**Appendix 9:** MCDI Comparison of Categories from Baseline to TP1 (Comprehension Percentages) and from TP2 to TP3 (Production Percentages) across Groups (BS *N* = 14; EV *N* = 11; ENV *N* = 10; and Non-intervention Group *N* = 12. Total *N* = 47
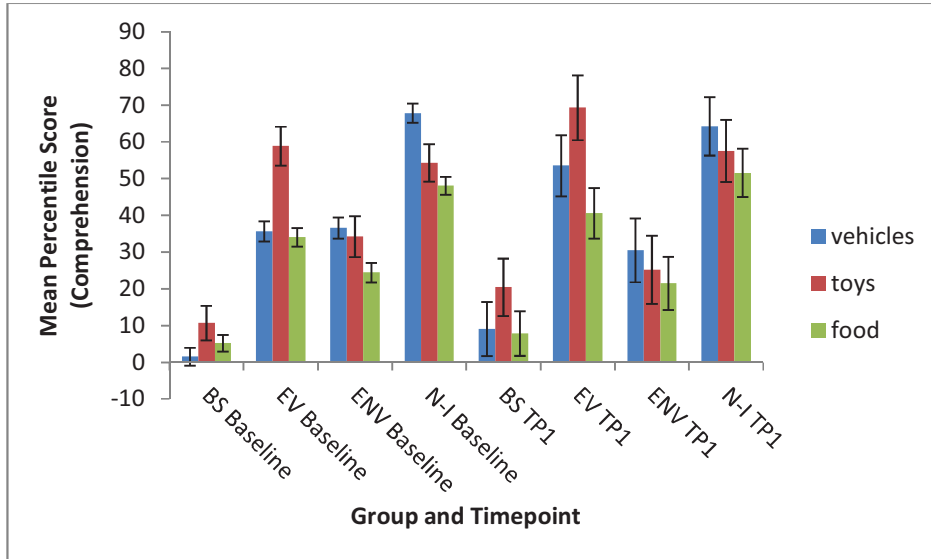
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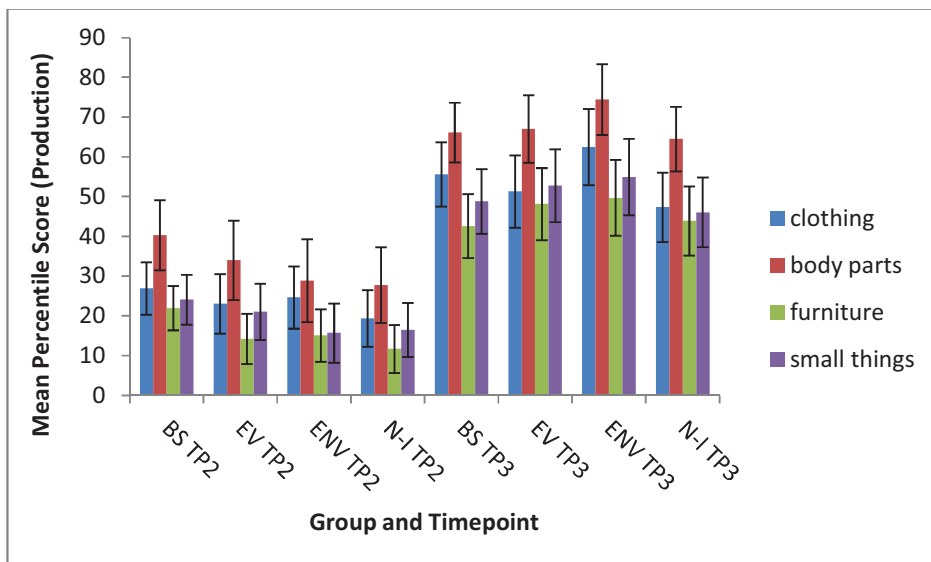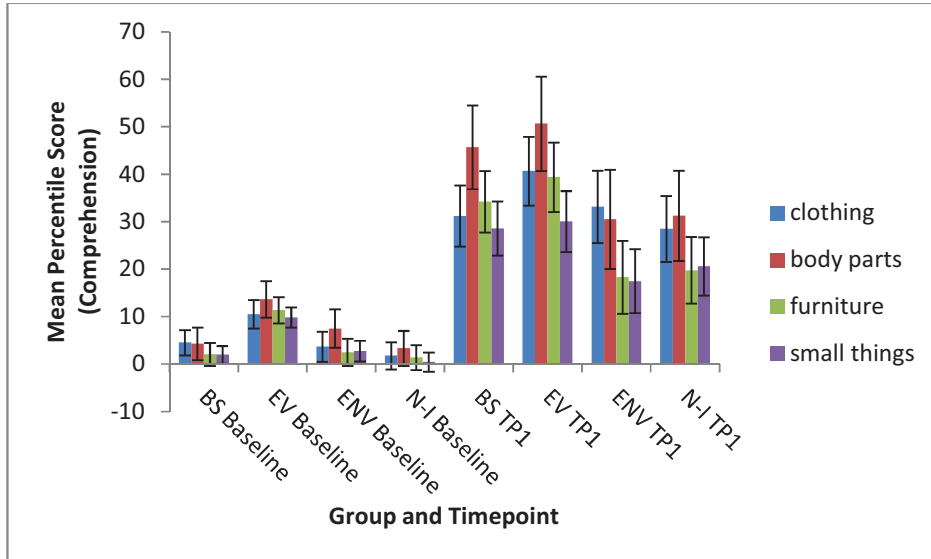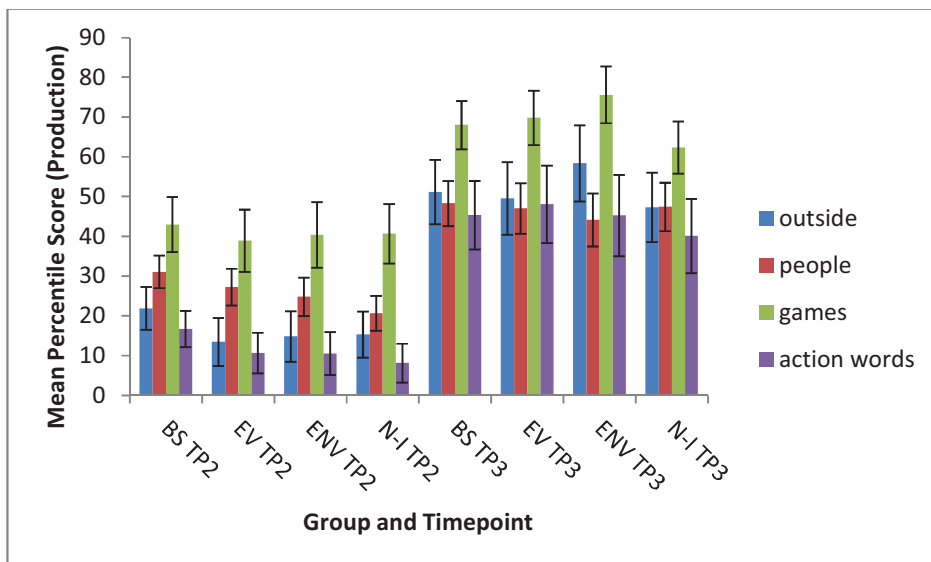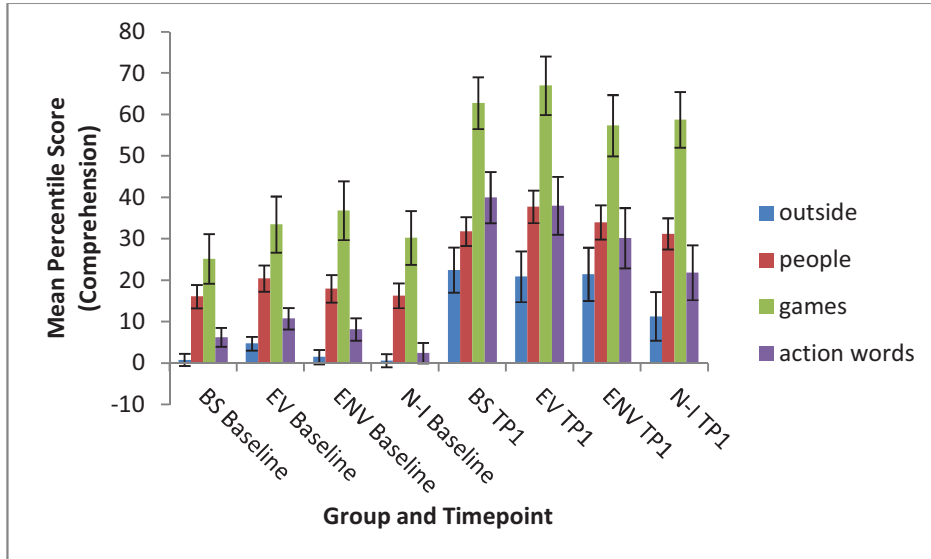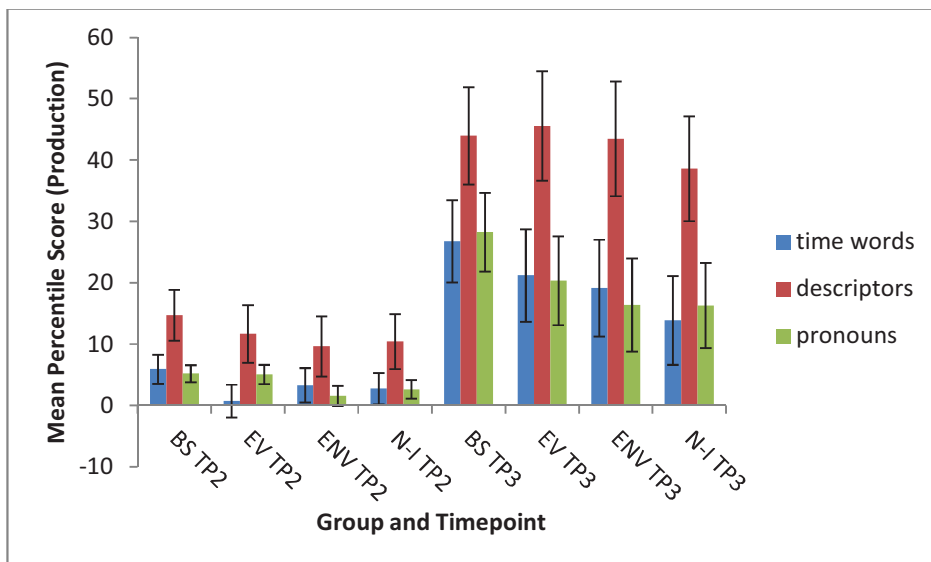
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Appendix 10: Words 'signed' by BS infants

ID/Gender	Nouns	Action Nouns	Actions	Social Expressions	Adjectives	Other	Pointing	Social Expressions	Adjectives	Other
F1	7	6	4	4	0	3	0	4	0	3
F2	2	4	3	4	0	0	0	4	0	0
M1	25	22	14	4	8	4	4	4	8	4
F3	1	4	1	2	0	0	0	2	0	0
F4	2	2	3	0	0	0	0	0	0	0
M2	11	15	8	1	1	3	0	1	1	3
F5	18	22	13	8	3	4	2	8	4	4
F6	3	2	5	3	0	0	0	3	0	0
M3	1	1	2	4	0	1	0	4	0	1
M4	2	2	0	0	0	0	0	0	0	0
M5	1	1	1	1	0	1	0	1	0	1
M6	11	10	4	1	2	2	0	1	2	2
F7	1	6	1	0	1	3	0	0	1	3
M7	1	0	0	0	0	1	0	0	0	1

Appendix 11: Transcription ID66

0.23 Mum: A…. Shall we look and see what's in the box? (Signs 'Look' to A, looks at her and brings the 'look' sign twds <mark>points to</mark> the toy box. Mum ¾ turned away from the camera, face hidden).

A looks at Mum and then at the toy box.

Mum: What's in the box?

A makes a small sound.

Mum: What would you like to play with?

A: Deh. (Points and looks at the dog-in-a-box)

Mum: <mark>Wh-</mark> what would you….what's this? (Lifts out the dog-in-a-box and puts it on the floor in front of A)

Mum: Aah! What is it? <mark>'s this?</mark>

A: Deh-deh. (Points and looks at the dog)

Mum: Is it a doggy? (signs 'dog')

A looks at the dog.

Mum: Say 'Hallo doggy'. Hallo doggy. (Waves at the dog and signs 'dog' again)

A: Deh. (Continues looking at the dog)

Mum: Ah. Shall we say 'Bye-bye'? (signs 'bye').

Mum: Can you push the dog? Can you push the dog down? (Points at the dog then gestures pushing the dog down)

A watches what Mum is doing and glances up at her.

Mum: Say 'Bye-bye doggy' (signs 'bye').. Aah, put the lid on. (Pushes the dog slowly into the box and shuts the lid)

A looks at the box.

Mum: He's gone! (signs 'gone') Where's the doggy A…? (briefly signs 'where' <mark>Holds hands out palm upwards)</mark>

A keeps looking at the box.

Mum: <mark>Can</mark> We turn the handle? Whoo. (Bends forward and starts to turn the music handle)

The tune starts to play.

Mum: Aaah! What's that noise? (signs 'noise') Can you hear it? (Looks at A <mark>and signs 'Hear')</mark>

A looks up at Mum.

The dog suddenly pops up.

Mum: Oh! What was that? (Holds hands out palms up and looks at A)

A glances up at Mum then back at the box.

Mum: Hallo dog. (signs 'hello' and looks at A).

A tentatively touches the music handle.

Mum: Hallo dog. (Signs 'hello' and looks at A)

A: Deh.

<mark>Mum: What is it?</mark>

A looks at and touches the dog then bends forward to touch the dog with her head.

Mum: Awww, is that a kiss for doggy? (Pushes the box a little nearer to A)

517

A: Deh-deh (Looks up at Mum and signs 'dog')

Mum: Doggy. (Signs 'dog' and looks at A)

A looks at Mum and ==blows== ==puffs out her cheeks==.

Mum: You blowing him a kiss? (Looks at A, raises hand to mouth and blows A a kiss)

A bends forward again to touch the dog with her head.

Mum: Awwww. Hello dog. Hello. (signs 'hello').

A: Deh. Looks at and touches the music handle.

Mum: You want to turn the handle? (Holds her hand above the box and turns it a little so that the handle is nearer A)

Mum: Shall we say 'Bye-bye' to the doggy. (Looks at A and signs 'bye'.)

A looks at Mum.

Mum: Shall we hide the doggy? (Signs 'hide' and looks at A.)

Mum (whispering): The dog (signs 'dog')

A glances at the box.

Mum: We hide him? (Semi-signs 'hide' and looks at A.)

A looks down at and touches the box.

Mum: Say 'Bye-bye'. (Waves her hand at the dog and starts to push it down into the box)

A glances up at Mum then back at the disappearing dog.

Mum: There he goes. (Pushes the dog into the box and shuts the lid)

A watches the dog disappear.

Mum: All gone (signs 'all gone')

A looks at the box and touches the lid with her finger.

Mum: Can A…. turn the handle? Go on then. A…. turn it. Shall Mummy help? (Turns the handle a little)

A watches Mum turn the handle.

The dog pops up.

Mum: Up!

A looks at the dog then glances up at Mum.

Mum: I wasn't expecting that. Shall we say 'Bye-bye' again. (Pushes the dog down then lets it up again and signs 'bye' at the dog)

A watches what Mum is doing.

Mum: Bye-bye. (Pushes the dog into the box and tries to shut the lid)

A watches what Mum is doing.

Mum: Woops. I don't think he wants to go down, does he? (Is unable to secure the lid and the dog pops up again)

A: Beh-beh. (Looks at the dog)

Mum: Ohhh, he's back again. (Turns the handle, playing the tune until it finishes)

A shuts the lid against the dog.

Mum: Right. Shall we say 'Bye-bye'? (signs 'bye' at the dog).

A looks up at Mum.

Mum: We'll hide the doggy? (Looks at A and signs 'hide').

A continues to look at Mum, hand held out towards the dog.

Mum: Are you ready? Mmmm. (Pushes the dog into the box and shuts the lid)

A watches what Mum is doing.

A touches the handle.

Mum: Can A…. turn the handle? Can A…. turn it?

A looks at and touches the handle.

Mum turns the handle, producing the tune.

A: Yeh. (Watches what Mum is doing, ==rotating== ==wiggling== ==her feet in imitation of mum turning the handle==, and touches the lid)

Mum: Ready? Is he coming? Ready, ready? (Looks at A and turns the handle)

A: Deh. (Looks up at Mum)

Mum: Aah. ==Pop!== ==Up==!

The dog pops up.

A gives a start and looks up at Mum.

Mum: Pop! It's a doggy! Hello. Hello doggy. (signs 'hello')

A leans forward and touches her head against the dog again.

Mum: Can you say 'Hello' to him? Hello. Hello. (signs 'hello'. Leans forward to look closely at A and the dog)

A looks at and touches the dog and then tips the lid against it.

Mum waves her fingers at the dog.

A keeps her hand on the dog.

3.28 Mum: Why don't we put the doggy there and see what else is in this box of toys? (Moves the dog-in-a-box back behind A)

A makes little breathless noises and points at the toy box.

Mum: What would you…what would you want to play with? Can you see…can you see them? Can you choose something? (Moves the toy box next to A.)

A touches a book, sticking up over the top of the box.

Mum: Ohhh! What's that A….? What is it? (Takes a book out of the box and holds it in front of A moving the toybox a little further back with her elbow).

Mum: look!

A: Beh! Looks and points at the book.

Mum: A book! Is it A….? (she starts to sign 'book' but notices that A has gone back to looking & pointing at the toy box. She lays the book on the floor in front of A, looks twds the toy box and moves it as she says) 'Is it a book?' (and signs 'Book')

A: ==D==Yeah. ==D==Yeah. (Glances at the book but then looks and reaches towards the toy box)

3.50 Mum: Well what else is there? What's this? (Lifts out the doll and places it in front of her so A can see it)

A: da- ee (she looks at the doll).

Mum: What's this? (Holds the doll in front of her, facing A and looks at A)

A: Deh! (Points at the doll).

Mum (sitting the doll on the floor in front of her): Is it a baby?

A: Yeah. Glances at the doll continuing to look and points at the toy box.

Mum: A baby (signs 'baby'). Is it a baby? (continues to sign 'baby' but breaks this off when she sees A is still looking at and interested in the box.

A: Deh…yuh…oh (pointing again at the toy box).

4.04 Mum: What else have we got?

A watches Mum reaching into the box.

Mum: Ohhh… (Takes out a felt hat.)

A: Deh (tracks the hat in Mum's hands).

Mum: what's this?

A: wuh (she looks from the hat up to Mum and holds her arm up beside her head (signing 'hat').

Mum: Is it a hat? A hat! (Looks at A and signs 'Hat')…Is it a hat? (signs 'Hat' and looks at A as before).

A continues looking between Mum & the hat.

Mum (reaches forward and puts the hat on A): A wear the hat. Oh!

A looks at her Mum and puts her hand up to take the hat off.

Mum: That's lovely (signs 'lovely')…a hat. (Looking at A.)

A: Agh. After a bit of a struggle A gets the hat off.

A extends her arm towards the toy box again, wiggling her feet: djeah, djeah, djeah…

522

Mum: What else is in here? Reaches into the toy box again.

A: Ooh-i-do. (Watches what Mum is doing)

4.27 Mum: Ohh, what's this? (Takes out a green plastic ball and holds it out in front of A)

A: Ba. (Looks at the ball)

Mum: A ball. A ball. (Puts the ball on the floor between A's legs and signs 'Ball')

A glances at the ball, then slightly to the side.

Mum: Do You want to play catch with the ball with dolly? (A looks at the doll) …With the baby? (Sits the doll in front of her knees and strokes its hair.)

A looks at and extends her arm towards the toy box but returns to look at the ball.

Mum: Can you throw the ball to the baby?

A continues to look towards the toy box, making little breathless sounds. Then reaches down and picks up the ball.

Mum: Can you throw the ball?

A looks at the doll and lets the ball slip out of her hands and roll away in front of her.

Mum: Oops! It's gone. (Both Mum and A track the rolling ball. Mum then looks at A)

A looks up at Mum and reaches out slightly towards the ball.

Mum: Shall the baby go and get it? (Looks at A then moves the doll towards the ball, as if walking)

Mum: Baby go and get the ball. Ohhhh! (Crawls over to get the ball)

A briefly watches Mum then looks back at and points towards the toy box, making little noises.

Mum: A….(A looks back to the doll) baby's got the ball. (Holds up the ball, puts it down and signs 'Ball'.)

Mum: You ready? Ready? (Signs 'Ready' and looks at A.)

A glances at the doll and then at Mum.

Mum: Steady. (Signs 'Steady' and looks at A.)

A looks down at the ball in anticipation.

Mum: Go! (signs 'go' and gasps as she throws the ball to A.)

A ignores the ball, looks at the doll and looks back at and points towards the toy box, making little noises.

Mum: Shall we see what else is in this box? (Stretches over to the box.)

A makes little noises whilst looking at the toy box.

Mum: What else is there?

A makes excited little noises whilst watching Mum look in the box.

5.14 Mum: Oh look. What's that? (Lifts out the teddy bear puzzle board and holds it in front of A)

A looks briefly at the teddy puzzle and then points and looks back at the toy box, making little breathless sounds.

Mum: A teddy bear. (Puts the teddy bear puzzle on the floor and looks back into the toy box)

A continues making little breathless noises and looking towards the toy box.

5.24 Mum takes the tweeting bird out of the toy box and holds it up.

A watches Mum.

Mum: And a *bird*. (signs 'bird' as she waves the bird in the air with the other hand, looking at A.)

A looks in the direction of the garden.

Mum: Can you hear it? Is it making ==a sound== (signs 'noise') ==you sad==? …….A….

A (looking back to the bird): A-da. (Smiles and points at it.)

Mum: A bird. (Moves the bird close to A)

A bends forward and touches the bird with her nose.

Mum: Oh! Hello! (Waggles the bird)

A: ah dya. (Points and looks at the toy box.)

Mum: ==Did== Can you say 'Hi' (looking at A, signs 'hello' & then reaches into the toy box again.)

A makes little breathless and other sounds and continues pointing and looking at the toy box.

5.46 Mum: What else is in here? Aaah! (Takes out and holds up the soft toy pig)…What's that? (she waggles the pig's left arm)

A: Da. Watches what Mum is doing, looks and points at the pig, then points and looks at the toy box again.

Mum: A piggy (signs 'pig').

A makes little breathless and other sounds and continues pointing and looking at the toy box.

Mum: What else? =='s up?== Ohh, let's have a look. (Reaches into the toy box again)

A watches and makes a little sound.

5.56 Mum: There's ==It's== a toy. (Brings out the ring stacker and puts it on the floor in front of A)

A glances at the stacker then points and looks at the toy box again.

Mum: You want to see what else is in here? (Reaches into the toy box again)

A makes little noises, watching Mum.

6.04 Mum: Ohhh. What's this one? What is it? (Brings out the plastic tub)

A looks at the tub and makes little breathless noises.

Mum: Is it dolly's….is it the baby's clothes? (Opens the tub and signs 'baby')

A looks up at Mum.

Mum: What's this one (Holds up the doll's hat)... for baby?

A looks at the hat then points towards the rest of the clothes in the tub.

Mum: What is it? Is that her hat? (Signs 'Hat' and looks at A.)

A looks up at Mum signing then makes little noises and points at the tub.

Mum: Is that baby's hat?

A makes little noises and points at the tub and clothes again.

Mum: Uh-hmm. (Puts down the hat)

A makes more little noises and looks at the tub and doll's clothes.

Mum (Holds up the doll's bag): And this is her bag (signs 'Bag')…baby's bag…

A glances at Mum and then looks at the bag.

Mum: Do You want to hold it? (Hands the bag to A.)

A: Tuh. (Takes the bag and points and looks at something on the floor.)

Mum sits the doll next to A

A: Tuh. Hum, hum. (Continues looking at something on the floor.)

Mum: Can you put dolly's hat on? (Holds out the hat to her)

A ignores the hat and points past it to something on the floor, making little breathless noises.

Mum: You want to see what else there……oh, what's this? (Looks in the tub and takes out a t-shirt, which she shows to A.)…ahh…that's a t-shirt…

A continues looking and pointing at the tub.

Mum (picking up the tub and bringing it closer to A): You want to have a look in the bag?

A puts her hand in the tub.

Mum: What's that one? (Looks at A)…

A: Doh. (Looks into the tub and at the floor beside her)…

A: Deh/dere. (Picks out a cloth from the tub and holds it out towards Mum, looking at her)

Mum: Uhh! What *is* it? Holds out her hand and looks at A.

A: Deh/dere. Looks into the tub and lifts out the doll's brush.

Mum: What is it? (Points at the brush and looks at A)

A looks intently at Mum then puts the brush back in the tub and looks down.

Mum: Is it a brush? (signs 'brush')

A picks up the brush and holds it out towards Mum, looking at her.

Mum: Is there a brush? (signs 'brush', looks at A & leans twds the tub)

Mum: Look at for dolly's hair (taps the doll's hair)...Can you brush dolly's hair? (she looks at A)

A looks at the doll and drops the brush into the tub.

Mum: Can you brush the baby's hair? (Touches the doll's hair and looks at A)

A looks at Mum, looks at the doll and touches its hair. She looks back at mum as she does so.

Mum: That's her hair (she nods gently)

A puts her hand in the tub and looks uncertainly at the things around her.

Mum (looks at the toys on the floor): All these toys A….

A looks at one or two of the items from the tub then takes hold of the brush.

Mum (whispering & reaching forward to mime brushing the doll's hair): Can you brush it? Can you brush it her hair?

A looks at the doll then touches its hair with the brush.

Mum: Yeeah! Well done.

A glances at Mum and then looks at the brush.

Mum: Good girl. Well done. (she looks at A and signs 'good').

A plays with the brush and the tub.

Mum: Can you brush it?

A lifts the brush up to her mouth & looks at ther mum.

Mum: No. ??????? Not for the mouth (Moves the brush away from A's mouth)

A looks at Mum and gently pulls the brush away from Mum's hand. (She starts to look back at the toybox, pointing)

Mum: Can you brush your hair….can you brush A…'s hair? (Looks at A)

A makes a small sound and reaches towards the toy box.

Mum: Or brush Mummy's hair? (continuing to lean into Looks at A)

A looks at the doll and touches its hair with the brush.

Mum: Dolly's hair. You brush baby's hair. (Watches what A is doing)

A puts the brush in the tub then up towards her mouth, simultaneously looking at Mum.

Mum: Not for the m-… (she reaches for the brush)

A looks at Mum and pulls the brush away from her mouth and away from Mum.

Mum: Can you brush Mummy's hair? (continuing to lean into Looks at A.)

A waves the brush around and touches the ring stacker with it.

Mum: Brush her hair. Ohhh. (Mimes brushing the doll's hair)

A puts the brush back into the tub and looks at it.

Mum: Back in the box. Put it in the box (she gestures putting something in the box)

A glances at Mum's hands.

Mum: What about dolly's hat? (Picking up the doll's hat and holding it in front of A)

A glances at the hat then looks at the toy box.

Mum: Where's the hat A….?

A: Duh. Reaches out and touches the lip of the toy box.

Mum: Shall we see what else is in here? What's in there? (Tips the toy box towards A)

A looks at the toy box.

8.26 Mum: Aah! Look. (Takes out a toy horse from the box)

A: Byuh, byuh, byuh. (Looks at what Mum is holding)

Mum: Mummy move these things out of the way so we can see. (Puts the horse back in the toy box and moves the ring stacker doll, book and teddy puzzle to one side)

A watches Mum moving the toys away then picks up the brush and puts it to her mouth, looking at Mum.

Mum: We don't have a lot of space here, do we? Can you put it… (she raises the tub to A for her to put the brush away then notices A putting the brush to her mouth)

A sees that Mum has seen her and takes the brush away from her mouth.

Mum (shaking her head): …..Not, no…????? not f-…not for the mouth not for your mouth. (Puts the tub down, takes the brush off A and puts it in the tub)

A looks at the brush in the tub then turns and points back at the toy box making little noises.

A: he -uh

Mum: Shall Will we see? (Lifts the cow-truck out of the box)

8.45 Mum: Aah! What's this? (Puts the cow-truck on the floor in front of A and also takes another toy out of the box)

A: Bweh. Looks at the truck.

Mum: What is it? Presses down the cow driver and looks at A.

A looks at the truck then turns back to look and point at the toy box, making little breathless noises.

8.56 Mum: I think you want to see everything that's in there, don't you. Lifts out the post box and holds it up for A, looking at her)

A looks at the post box.

Mum: A post box. (Looks at A)

A makes a little sound and again turns to look at and touch the lip of the toy box.

Mum: It's nearly all gone A…., look. (Tips the box fully towards A to show her the one or two toys left in the box)

A (bounces up and down slightly, flapping her arms slightly and making small noises): dyeah, dyeah...

9.08 Mum takes out a sheet and two small plastic plates, which she passes to A.

A takes hold of and looks at the plates.

Mum: Ohh Ah…that's everything. That's everything. What would you like to play with?

A examines the plates.

Mum: Have you got a saucer? (rubs the top of her palm in a circle – this is similar to sign 'saucer').

A glances at Mum then looks at and points towards the toy box.

Mum: That's everything look…it's all gone. (Stands the empty toy box on its end so that A can see inside)

Mum: It's empty.

A: Eh. (Points back at the toy box then continues examining the plates, gives a big sigh and looks up at Mum)

Mum: Yeah. That's everything. (Nods and looks at A)

A reaches forward and pulls the cow truck towards her.

Mum: What have you got there? What is it? (Taps the cow driver, waggling its head).

A (returns to playing with the plates then holds one up to Mum and looks at her): Deh…

Mum reaches for the plate.

A (looks at Mum and pulls the plate away): Nuh… (Briefly resumes looking at them and again half-holds the plate up)...duh…

Mum raises her hand up – but not towards A or the plate.

A examines the plates.

Mum: Is that for Mummy? (Reaches out her hand and looks at A)

A waggles her feet and continues holding and looking at the plates.

Mum: Is that saucer for Mummy? (she rubs her palm again in a circular motion similar to sign 'saucer' and looks at A)

A makes little gasping noises, looks at the camera, smiles, turns towards Mum whilst rubbing the plates together.

Mum: What about this thing? (Picks up the cow truck and moves further away from A)... I think…

A looks at the toys on the floor.

Mum: There's the cow A…(signs 'Cow', looking at A)

A looks at Mum

Mum: ...A cow...

A holds the plates between her legs and points at the toy box again, making little breathless noises.

Mum: Ready-ready!

 (A looks back at the truck)

Mum presses the cow down.

Mum: Ready? (signs 'Ready' and looks at A)

A glances at Mum.

Mum: Steady (signs 'steady')... Go! (half-signs 'go'. She presses the cow down and pushes the truck across to A)

Mum: Aah.

A ignores the truck and reaches forward towards the sheep figure lying on the floor between her and Mum.

Mum: And what's this one? (Picks up the sheep and holds it in front of A, waggling it slightly) What is it?

A: Dah. (Looks at the sheep and then at Mum)

Mum: Is it a sheep…a sheep? (signs 'Sheep' and looks at A). 10.23 (10 mins)

Key:
Yellow = remaining disagreement btw IORs
Blue = agreement reached
Purple = agreed omissions

Appendix 12: AQS Questions (http://www.psychology.sunysb.edu)

1. Child readily shares with mother or lets her hold things if she asks to.
2. When child returns to mother after playing, he is sometimes fussy for no clear reason.
3. When he is upset or injured, child will accept comforting from adults other than mother.
4. Child is careful and gentle with toys and pets.
5. Child is more interested in people than in things.
6. When child is near mother and sees something he wants to play with, he fusses or tries to drag mother over to it.

7. Child laughs and smiles easily with a lot of different people.
8. When child cries, he cries hard.
9. Child is lighthearted and playful most of the time.
10. Child often cries or resists when mother takes him to bed for naps or at night.
11. Child often hugs or cuddles against mother, without her asking or inviting him to do so.
12. Child quickly gets used to people or things that initially made him shy or frightened him.
13. When the child is upset by mother's leaving, he continues to cry or even gets angry after she is gone.
14. When child finds something new to play with, he carries it to mother or shows it to her from across the room.
15. Child is willing to talk to new people, show them toys, or show them what he can do, if mother asks him to.
16. Child prefers toys that are modeled after living things (e.g., dolls, stuffed animals).
17. Child quickly loses interest in new adults if they do anything that annoys him.
18. Child follows mother's suggestions readily, even when they are clearly suggestions rather than orders.
19. When mother tells child to bring or give her something, he obeys.
20. Child ignores most bumps, falls, or startles.
21. Child keeps track of mother's location when he plays around the house.
22. Child acts like an affectionate parent toward dolls, pets, or infants.
23. When mother sits with other family members, or is affectionate with them, child tries to get mom's affection for himself.
24. When mother speaks firmly or raises her voice at him, child becomes upset, sorry, or ashamed about displeasing her.
25. Child is easy for mother to lose track of when he is playing out of her sight.
26. Child cries when mother leaves him at home with babysitter, father, or grandparent.
27. Child laughs when mother teases him.
28. Child enjoys relaxing in mother's lap.
29. At times, child attends so deeply to something that he doesn't seem to hear when people speak to him.
30. Child easily becomes angry with toys.
31. Child wants to be the center of mother's attention. If mom is busy or talking to someone, he interrupts.
32. When mother says "No" or punishes him, child stops misbehaving (at least at that time). Doesn't have to be told twice.
33. Child sometimes signals mother (or gives the impression) that he wants to be put down, and then fusses or wants to be picked right back up.
34. When child is upset about mother leaving him, he sits right where he is and cries. Doesn't go after her.
35. Child is independent with mother. Prefers to play on his own; leaves mother easily when he wants to play.
36. Child clearly shows a pattern of using mother as a base from which to explore. Moves out to play; Returns or plays near her; moves out to play again, etc.
37. Child is very active. Always moving around. Prefers active games to quiet ones.
38. Child is demanding and impatient with mother. Fusses and persists unless she does what he wants right away.
39. Child is often serious and businesslike when playing away from mother or alone with his toys.
40. Child examines new objects or toys in great detail. Tries to use them in different ways or to

take them apart.

41. When mother says to follow her, child does so.
42. Child recognizes when mother is upset. Becomes quiet or upset himself.
    Tries to comfort her. Asks what is wrong, etc.
43. Child stays closer to mother or returns to her more often than the simple task of keeping
    track of her requires.
44. Child asks for and enjoys having mother hold, hug, and cuddle him.
45. Child enjoys dancing or singing along with music.
46. Child walks and runs around without bumping, dropping, or stumbling.
47. Child will accept and enjoy loud sounds or being bounced around in play, if mother smiles
    and shows that it is supposed to be fun.
48. Child readily lets new adults hold or share things he has, if they ask to.
49. Runs to mother with a shy smile when new people visit the home.
50. Child's initial reaction when people visit the home is to ignore or avoid them, even if he
    eventually warms up to them.
51. Child enjoys climbing all over visitors when he plays with them.
52. Child has trouble handling small objects or putting small things together.
53. Child puts his arms around mother or puts his hand on her shoulder when she picks him
    up.
54. Child acts like he expects mother to interfere with his activities when she is simply trying to
    help him with something.
55. Child copies a number of behaviors or way of doing things from watching mother's behavior.
56. Child becomes shy or loses interest when an activity looks like it might be difficult.
57. Child is fearless.
58. Child largely ignores adults who visit the home Finds his own activities more interesting.
59. When child finishes with an activity or toy, he generally finds something else to do without
    returning to mother between activities.
60. If mother reassures him by saying "It's OK' or "It won't hurt you", child will approach or
    play with things that initially made him cautious or afraid.
61. Plays roughly with mother. Bumps, scratches, or bites during active play.
    (Does not necessarily mean to hurt mom)
62. When child is in a happy mood, he is likely to stay that way all day.
63. Even before trying things himself, child tries to get someone to help him.
64. Child enjoys climbing all over mother when they play.
65. Child is easily upset when mother makes him change from one activity to another.
    (Even if the new activity is something child often enjoys.)
66. Child easily grows fond of adults who visit his home and are friendly to him.
67. When the family has visitors, child wants them to pay a lot of attention to him.
68. On the average, child is a more active type person than mother.
69. Rarely asks mother for help. Middle if child is too young to ask. Low: Often asks mother for
    help.
70. Child quickly greets his mother with a big smile when she enters the room. (Shows her a
    toy, gestures, or says "Hi, Mommy").
71. If held in mother's arms, child stops crying and quickly recovers after being frightened or
    upset.
72. If visitors laugh at or approve of something the child does, he repeats it again and again.
73. Child has a cuddly toy or security blanket that he carries around, takes it to bed, or holds
    when upset. (Do not include bottle or pacifier if child is under two years old.)
74. When mother doesn't do what child wants right away, child behaves as if mom were not going
    to do it at all. (Fusses, gets angry, walks off to other activities, etc.)
75. At home, child gets upset or cries when mother walks out of the room. (May or may not follow
    her.)
76. When given a choice, child would rather play with toys than with adults.
77. When mother asks child to do something, he readily understands what she wants (May or
    may not obey.) Middle if too young to understand Low: Sometimes puzzled or slow to
    understand what mother wants.
78. Child enjoys being hugged or held by people other than his parents and/or grandparents.
79. Child easily becomes angry at mother.
80. Child uses mother's facial expressions as good source of information when something looks

risky or threatening.

81. Child cries as a way of getting mother to what he wants.

82. Child spends most of his play time with just a few favorite toys or activities.

83. When child is bored, he goes to mother looking for something to do.

84. Child makes at least some effort to be clean and tidy around the house.

85. Child is strongly attracted to new activities and new toys.

86. Child tries to get mother to imitate him, or quickly notices and enjoys it when mom imitates him on her own.

87. If mother laughs at or approves of something the child has done, he repeats again and again.

88. When something upsets the child, he stays where he is and cries.

89. Child's facial expressions are strong and clear when he is playing with something.

90. If mother moves very far, child follows along and continues his play in the area she has moved to. (Doesn't have to be called or carried along; doesn't stop play or get upset.)

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Do Ear/Throat Conditions Affect Parent/Child Interaction? An Investigation of Socio-emotional Development and Overall Quality of Life

My name is Lorraine Howard and I am a 2nd year PhD psychology student at Northumbria University. **I am undertaking this study as part of my PhD course and invite you to take part**. However, before you decide to do so, I need to be sure that you understand firstly why I am doing it, and secondly what it would involve if you agree. I am therefore providing you with the following information. Please read it carefully and be sure to ask any questions you might have and, if you want, discuss it with others including your friends and family. I will do my best to explain the project to you and provide you with any further information you may ask for now or later.

Background to the study

Past studies have investigated how glue ear might affect language development and behaviour, but few studies have looked at the effects on relationships, especially within the family, or at the child's general socio−emotional development. A study by Goldberg et al. (1988) showed that children with chronic medical conditions could be affected in these areas more than those who were free from such illnesses. In addition, other studies suggest that professionals and parents tend to downplay the effects of ear/throat conditions [15] and how it affects quality of life in the family. It is important to investigate these findings further in order to discover how we can help.

This study aims to address these questions.

What the study involves

The study involves 3 groups of infants and their families. There will be one session, lasting no more than 30 mins. Your child will be between the ages of 18 – 42 months. Group 1 is for infants diagnosed with otitis media with effusion (OME) or glue ear. Group 2 is for infants who have suffered from intermittent bouts of throat infections without a hearing component. Group 3 is for children with no history of hearing difficulties. It is hoped to recruit 15 infants for each group. The researcher is collaborating with Mr Stephen Powell, MBBS MRCS(Ed), Specialist Registrar Otolaryngology Northern Deanery, Sunderland NHS Trust.

There are 3 activities involved in the study which will all take place at the clinic:

1) 1 video recording to be taken of parent and infant involved in structured play. Each video will last no more than 10 mins.
2) 1 questionnaire (ASQ:SE) (no more than 10-15 mins)
3) 1Quality of Life (QoL) questionnaire

A subset of parents will be asked if they will partake in a sorting task: the AQS, as well as complete the MacArthur Bates CDI.

Are there discomforts or risks involved?

There are no identified risks to participants or families in this study. Information will be collected via questionnaires, and video−recording undertaken at the clinic. Video−recording will require written permission from the parents. Parents may feel initially self-conscious of the camera, this is natural. But you will become accustomed to it. Information will be shared between the researcher and her supervisors (2) only. The researcher will inter-rate the data provided with a colleague PhD student. This is essential to ensure independent validity of the video data collected. Only the researcher will seek access to individual children's medical records in order to ascertain information pertaining to the severity, duration, onset and comorbidity associated with the child's condition.

Ethical consent for this study has already been approved by the University of Stirling & Northumbria University's respective Psychology Departments, and the researcher has enhanced disclosure from DisclosureScotland. Additional Disclosure certification will be sought from the hospital as required. There is no attempt to change parenting styles, or to criticise parental relationships with their child. It is not anticipated that there will be concerns regarding potential abuse, however, the researcher will be obliged to discuss these with her supervisor should the need arise.

If parents express need for additional assistance in parenting, the researcher will carry leaflets for relevant professional bodies, such as ParentingUK, Parentline, Children 1st, and the NDCS. These will only be produced where requested by the parent.

The low level of perceived risk and inconvenience is expected to be substantially outweighed by the benefits achieved from investigating parent−infant relationships that involve children with OME.

What will happen to the information collected?

Data will be kept in a lockable filing cabinet in the researcher's own room. Only the researcher will have access to these materials. Personal identifiers (such as names, addresses, and postcodes) will be held separately from a system of designated codes allocated to each participant. These will be held in electronic databases on a standalone computer. Both the computer and the databases will be password protected.

All materials will be registered. Permission will be sought from parents if the researcher wishes to cite direct quotes in subsequent publications but every effort will be undertaken to ensure that they are not identifiable to specific participants.

All personal data will be stored until the 3rd year of study (2011) in order to refer to any errors or anomalies that occur during analyses and write−up. Research data (non-identifiable) will be stored for 5 years.

What are your rights?

You do not have to take part in this study and, even if you do, you are free to withdraw at any time without having to give me any explanation. If you do not take part or if you withdraw, this will have no effect at all on the treatment you receive now or in the future or your relationship with the staff which look after you.

The Fife and Forth Valley Research Ethics Committee, which has responsibility for scrutinising all proposals for medical research on humans, has examined the proposal and has raised no objections from the point of view of medical ethics.

Thank you for reading this Information Sheet and taking time to consider taking part.

Researcher: Lorraine Howard
Principal Supervisor: Prof Gwyneth Doherty-Sneddon, Assistant Dean, Northumbria University
Second Supervisor: Dr Alex Gillespie, Psychology Dept, University of Stirling.

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Date

Dear

PhD study of the effects of throat/ear conditions on the family and child

I have asked your otologist/ ENT consultant to mention my study to you. I am a mature PhD student with 17 years' experience of working with families and children. I am interested in investigating the experiences you, your child and family may have encountered during episodes of any of the following: throat, ear infections, or hearing loss in your infant. The aim is to compare your experiences across these three groups as well as with other children and their families who have no history of such infections. By doing this we can assess the comparable effects of each condition on general health and family life.

I am asking for a maximum of 20-30 mins of your time during your clinic appointment. During this period I'll be taking a little video footage of you and your child playing, and asking you to complete some questionnaires. (A sub-group of parents will be asked if they wish to complete two additional questionnaires but this will also be voluntary.) I will ask for permission to view your child's medical files but only to look at information regarding his/her hearing condition. All of the video data will be kept under lock and key, and your anonymity and confidentiality will be respected at all times.

The study will begin between 20/05/10 and end 31/07/10. You are under no pressure to take part and indeed, should you change your mind after the study has started, you will be able to withdraw your consent at any time. Depending on the stage of the study, you will be asked if some of your data can remain in the overall results. You will not be

identifiable from this in any way – but should you choose to withdraw consent from this, too, your wishes will be respected.

If you would like to discuss the project with me in more detail, or face-to-face, please do not hesitate to contact me. My email address is lorraine.howard@northumbria.ac.uk or tel. 0191 227 7244.

Thank you sincerely for your interest,

Yours faithfully,

Lorraine Howard

City Hospitals Sunderland **NHS**

NHS Foundation Trust

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Study Number: 09/S0501/2   Participant Identification Number for this study:

CONSENT FORM   (Appendix 13c: SRH Otitis Consent Form (version 3.1, 04/06/10)

<u>Title of study</u>: Do Ear and Throat Conditions Affect Parent/Child Interaction? An Investigation of Socio-emotional Development and Overall Quality of Life

<u>Name of Researcher</u>: Lorraine Howard

Please **initial** box

1. I/We confirm that I/we have read and understood the information sheet dated
   09/05/10 (version 6) for the above study. I/we have had the opportunity to consider
   the information, ask questions and have had these answered satisfactorily.

2. I/We understand that my/our participation is voluntary and that I/we am free to
   withdraw at any time without giving any reason, without any medical care or legal
   rights being affected.

3. I/We understand that relevant sections of my/our child's medical notes and
   data collected during the study may be looked at by individuals from the University
   of Stirling or from the NHS Board, where it is relevant to my/our taking part in this
   research. I/we give permission for these individuals to have access to my/our child's
   records.

4. I/We agree to take part in the above study.

5. I/We agree to video-recording of play sessions

6. I/We agree to the use of quotes in subsequent publications/presentations

_____   _____   _____

Name of participant   Date   Signature

_____   _____   _____

Name of person taking consent   Date   Signature