Investigating Sociocognitive Skills in 2 and 3 Year Old German-speaking Children with Typical and Delayed Language Development

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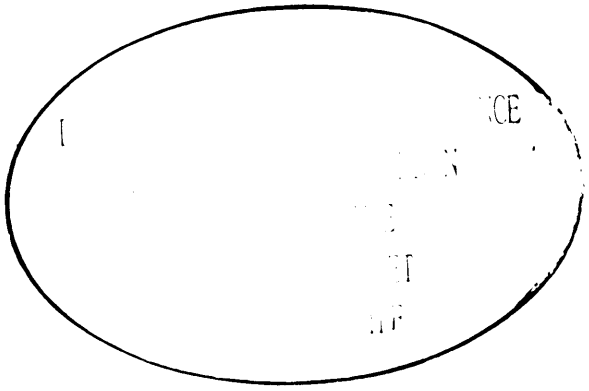

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Abstract

It has been estimated that 7% of children have language impairments. The early identification of these problems has been recognised as very important to prevent consequential social, behaviour and educational problems.

By the point when children start to acquire words, some of their sociocognitive skills are already quite elaborated and others' are developing rapidly. During the last decades the relationship between several sociocognitive skills and language has been examined in depth in the areas of typical child development as well as in children with autism. It has been found that these interpersonal skills are strongly associated with early language and communication abilities and further predict later language skills in typically developing children as well as children with autism. More recently, children's knowledge of other person's motivational and intentional states has become a focus of interest and has been predicted to be crucial for the acquisition of communication and language. This knowledge is inseparably connected with the acquisition of sociocognitive skills.

However, the relation between sociocognitive skills and specific deficits in language has been less extensively explored, but Chiat and Roy currently have begun to look at early processing skills that are known to underpin language development as predictors of later language disorders. Grown out of their research with English-speaking children, this project primarily aimed to investigate whether, and to what extent, performance on assessments which tap a range of interrelated sociocognitive skills differ between groups of 2 and 3 year old German-speaking children with typical and delayed language development. Furthermore, two novel assessments were specifically designed for this project to additionally investigate children's imitation skills.

It was found that the groups of language delayed children clearly showed deficits in all sociocognitive skills in comparison to the groups of typically developing children, though further analyses revealed overlaps between the performance of some individual cases of clinical children with the performance of the control children. In addition, mismatchs between sociocognitive abilities and specific linguistic abilities were observed in the individual profiles of some language delayed children. These findings are discussed in terms of possible impacts of the discovered sociocognitive deficits on the acquisition of language and communication, focussing on the role of imitation for the onset of children's vocabulary-spurt.

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List of Abbreviations

SCS: sociocognitive skills

SLI: specific language impairment

SD: standard deviation

1 Introduction

1.1 Why investigate the relation between sociocognitive skills and language deficits ?

It has been estimated that 7% of children have language impairments (Tomblin et al., 1997). The early identification of these problems has been recognised as very important to prevent consequential social, behaviour and educational problems (Catts, 1993; Rice et al., 1991). Currently, studies have begun to look at early skills that are known to underpin language development (Chiat & Roy, submitted) and their relation to communication and language impairments. Sociocognitive skills (SCS) have been a particular focus of attention.

Even neonates have been shown to have an interest in human faces (Goren et al., 1975) and to imitate facial movements (Meltzoff & Moore, 1977, 1997). By the point when children start to acquire words, some of their interpersonal cognitive skills are already quite elaborated and others are developing rapidly. The relationship between several SCS and language has been examined in depth in the areas of typical child development as well as in children with autism. SCS have been found to be strongly associated with early language and communication abilities and to predict later language skills in typically developing children as well as children with autism (Bates et al., 1979; Charman et al., 2003; Sigman & Ruskin, 1999; Toth et al., 2006).
Furthermore, work in the area of theory of mind and the findings of autism-related deficits in theory of mind (Baron-Cohen et al., 1985) have raised the question if deficits in sociocognitive abilities as mentalizing milestones are precursors of theory of mind (Happé & Frith, 1994).

More recently, children's knowledge and understanding of the other person's motivational and intentional states has became a focus of interest as it is inseparably connected with the acquisition and application of the 'basic' SCS (Lillard, 2002; Reddy, 2002). It is not sufficient that children physically see the face of a person opposite, visually detect the object to which a person refers or observe every detail of a modelled action. To be able to ignore accidental references between others expressions and real entities or to neglect unnecessary aspects of other's actions, infants have to understand that other individuals have own experiences and therefore their own intentions and goals. This knowledge about the intentional directedness of actions and utterances has been predicted to be crucial for the acquisition of social communication and language (Chiat, 2001).

Together, these findings have improved knowledge about early SCS and shed new light on their role in the acquisition of language. However, the relation between SCS and specific deficits in language has been less extensively explored. Based on the mapping theory (Chiat, 2001), Chiat and Roy (submitted) investigated the hypothesis that the SCS social responsiveness, joint attention and symbolic comprehension might provide better predictors of communicative and language deficits than language itself and, more specifically, might predict the nature of later deficits. They developed novel assessments of early SCS (Chiat & Roy, in prepatation) and found that children's performance on these assessments at 2-3 years was predictive of the nature of their difficulties with language and communication at 4-5 years.

This project empirically and theoretically grew out of Chiat and Roy's investigation with English-speaking children, together with current empirical evidence of the relation between language abilities and SCS in typically developing children and children with autism. On the basis of previous clinical observations and other researchers' findings on imitation (Toth et al., 2006) it was additionally hypothesised that young children with specific language delay compared to typically developing children also might reveal deficits in imitation abilities. This is the broad rational behind this primarily empirically driven investigation.

The following section aims to describe aspects of SCS relevant to this investigation and to report empirical findings about an associations between SCS and language. The theoretical framework of this project is outlined in section 1.3 and the main aims of this study are stated in the last final section.

1.2 Associations between SCS and language abilities

1.2.1 Social responsiveness: Shared attentiveness and emotional attunement

From the first months of life children appear very interested in human faces (Johnson & Morton, 1991). In response to adults' emotional attention they look at others' face and furthermore respond with emotional reactions and engagement in interactive behaviour (Murray & Trevarthen, 1985; Nadel & Tremblay-Leveau, 1999). Trevarthen (1979) called this early sharing of attentiveness and emotions primary intersubjectivity. In addition, Trevarthen and Aitken (2001, p.5) argue for an innate and "responsive conscious appreciation of the adult's communicative intentions" by the child, thus the perception of the caretaker as own identity with intentions and feelings. Accordingly, successful social referencing of typical developing children, that is children's ability to use adults' facial expression as cue for appropriate behaviour in ambiguous situations (Campos, 1983; Feinman, 1982), has been reported by the end of the first year of life (Hornik et al., 1987; Klinnert, 1984; Walden & Ogan, 1988).

Sigman et al. (1992) examined the duration of attention that autistic children addressed to individuals' negative emotional displays and found out that children with autism were less attentive to the expression of negative affects than typically developing children. Further studies provided evidence that infants with autism showed less response to their caregivers' expression of positive emotions in comparison to typically developing children (Dawson et al., 1990; Kasari et al., 1993).

This project focuses on infants' detection of other people's attention and affect as a very early form of mutuality in face-to-face interactions (Butterworth, 2001). To be able to perceive a person's emotions, a child needs the motivation to look at the adult's opposite face and additionally to 'tune into' this person. However, the exploration of children's further response, either in terms of an appropriate empathic reaction regarding the expressed emotion or in terms of social referencing (Campos, 1983; Feinman, 1992), is not addressed in this investigation.

Importantly, these first dyadic interactions take on the form of shared rhythmic patterns in rhymes and games and later on provide the context for the communication of early preverbal intentions through mimic, vocalisations and gestures (Papousek, 1989; Trevarthen et al., 1999). These protoconversations are essential for the acquisition of communication and language (Bateson, 1979; Bruner, 1975), inter alia because they represent one step towards the emergence of joint attention episodes which have been found to relate to early language development (see below).

1.2.2 Joint attention: Sharing, following and directing the focus of attention and intentionality vis-à-vis an object or event

The difference between social responsiveness and joint attention is the inclusion of a third party in the face-to-face interaction. In so called secondary intersubjectivity both social partners share one focus of attention and intention through referring to the same external object or event (Trevarthen & Aitken, 2001). This triadic interpersonal skill of checking, sharing, following and directing each others' focus of attention has been intensively examined over the last decades (Carpenter et al., 1998b; Tomasello & Farrar, 1986). Joint attention behaviour, which involves all these skills, emerges between 9-15 months (Adamson & MacArthur, 1995; Butterworth, 2001), although still confined by children's visual space (Butterworth & Jarrett, 1991).

The investigation of joint attention abilities in this study aims to explore children's response to joint attention (Brunisma et al., 2004). This involves infants' ability to check whether another person shares the same focus of attention through alternating her eye gaze between an external target and the person's face. It further involves the skill to monitor and follow a person's deictic shift in eye gaze or pointing to detect her intended focus. Importantly, even monitoring someone's gaze, as opposed to directing this gaze, requires the child to actively engage in the triadic interaction. First, she needs the motivation to share her interest with another person, secondly she must accept to be guided from someone else and thirdly she actively has to search for the purpose behind a person's action.

Research has linked joint attention skills with communication and language acquisition in typically developing children (Baldwin, 1995; Bloom, 2000; Carpenter et al., 1998b; Morales et al., 2000) and it has been presumed that joint attention is a precondition for language (Bruner, 1975, 1983). To avoid mapping errors through unintended object-word pairings in joint attention episodes, children importantly use physical cues like the speaker's direction of gaze or facial expression as pragmatic cues to search for the speaker's intended focus of attention (Baldwin, 1991, 1993; Tomasello, 1995). This ability to ignore accidental or meaningless mappings through the attunement to another person has been recognised as vital for language learning (Tomasello & Barton, 1994). In line with these findings, autistic children's joint attention skills have been found to be predictive of current and later language and communication outcome (Charman, 1998; Charman et al., 2003; Mundy et al., 1987; Sigman & Ruskin, 1999; Toth et al., 2006).

Finally, joint reference enables child and adult to mutually explore objects and events in the world, which constitutes to the development of symbolic capacities.

1.2.3 Symbolic comprehension: Comprehension of different types of symbolisation

DeLoache (2002, p. 207) defines symbolic representation as "something that someone intends to stand for or represent something else" and emphasises the challenge for children to acquire the dual representation of symbols, hence their real and abstract aspects. Regarding the developmental process of nonverbal symbolisation skills it is important to notice that symbolisation is a complex phenomenon and that different aspects and levels of symbolic knowledge evolve successively. Pretend play as a very early form of nonverbal symbolisation (Lillard, 2002) has been reported to emerge by 18-24 months (Fein, 1981; Nicolich, 1977). Tomasello et al. (1999) highlight the importance of distinguising between different types of symbolic behaviour and provide evidence that the comprehension of noniconic gestures as symbols is easier for young children than the comprehension of objects as symbols. Furthermore, they question whether children as young as 2 years truly comprehend pretense as symbolic or rather associate pretended actions with their observations of the use of real objects together with contextual and perceptual similarities between substitute and target. To what extent children at this age realise that pretend objects and events symbolise real objects and events cannot be answered to date. But irrespectively of the question when children realise the whole dimension of symbolisation it is essential that they detect that symbols are used intentionally to refer to real counterparts, and therefore develop the drive to seek for relations between the real and abstract world. To understand pretense they additionally need the ability to discover the goal behind pretend actions so they can complete missing elements of pretense episodes (Harris et al., 1994) or realise actions which have been carried out unsuccessfully (Meltzoff, 1995).

Concerning the acquisition of language, different types of symbolisation have been shown to be correlated with language abilities in typically developing children (Bates et al., 1979; Lewis et al., 2000; McCune, 1995; Nicolich, 1977) and children with autism (Mundy et al, 1987; Sigman & Ruskin, 1999). Interestingly, deficits in play skills have also been found to be associated with language impairment (see Casby, 1997 for a review). Again, it has been asked 'how symbolic' the different levels of play skills examined were and consequently which aspects of nonverbal symbolic behaviour are necessary for the acquisition of linguistic symbols (Huttenlocher & Higgins, 1978, cited in Lillard, 2002; Tomasello et al., 1999). Lilliard (2002, p. 199) concludes that "the fact that correlations are observed suggests some common underlying function; exactly what that is deserves further investigation".

1.2.4 Imitation: Production of gestures and actions on objects modelled by an adult

Developmentalists have shown that neonates are already able to imitate simple facial movements such as tongue protrusion and mouth opening (Meltzoff & Moore, 1977, 1997) and that 2 months olds are aware of being imitated (Nadel et al., 1999). The imitation of objects is possible by 9 months of age, and deferred imitation by 14 months (Meltzoff, 1988a, 1988b; Meltzoff, 1985).

Recently, neuroscientists have discovered a particular class of visuomotor neurons, called mirror neurons, in monkeys and humans. These neuronal systems showed patterns of activation while individuals were observing other individuals carrying out meaningful manual actions without a tool and are therefore supposed to underpin imitation ability (Rizzolatti et al., 2002).

Importantly, research emphasised that imitation is not a unitary but a complex skill, which assembles different types like the imitation of gestures and the imitation of actions on objects, and which can be either meaningful or meaningless. It has been found that individuals with autism can be separately impaired in body movements but not in the imitation of actions on objects (Stone et al., 1997). Different imitation types in young children also have been found to be associated to different other social and communicative behaviours in later development (Stone et al., 1997; Toth et al., 2006).

To make it even more complicated, imitative behaviour is closely linked to other SCS. The earliest forms of immediate imitation occur in dyadic face-to-face interactions and imitations of actions on objects are embedded in joint attention episodes.

Theoretically, imitation is hypothesised to establish a sense of early connectedness (Meltzoff & Gopnik, 1993), as a form of social learning to get to know about others' actions and intentions (Uzgiris, 1981, 1999) and as a form of nonverbal communication to establish long-lasting interactions within which intentional communication is developed (Nadel & Pezé, 1993).

In addition, research has revealed that immediate imitation is not just mimicking of actions but is guided by goals (Bekkering et al., 2000) and therefore requires more than symbolic and cognitive knowledge alone (Charman, 2006). Children from around 14-18 months imitate intended but not accidental actions on objects and ignore irrelevant aspects of the modelled acts (Carpenter et al., 1998 a)). Nevertheless, the interrelations between imitation and other developmental milestones are not fully understood to date.

Notably, the assumption that deficits in imitation abilities are mainly a consequence of symbolic deficits (Curcio, 1978) is not fully supported as poorer performance on meaningless

than meaningful actions on objects has been reported (Stone et al., 1997). Nor could sensorimotor skills account for observed imitation problems (Dawson & Adams, 1984; Sigman & Ungerer, 1984).

In terms of the acquisition of language, imitation performance has been proved to be longitudinally associated with language ability in typically developing children (Bates et al., 1979; Carpenter et al., 1998 a); Masur & Rodemaker, 1999). Furthermore, several investigations with autistic children have provided convincing evidence that imitation performance predicts language abilities later in life (Charman et al. 1997, 2003; Stone et al. 1997; Stone &Yoder, 2001; Toth et al. 2006) and moreover detected correlations between autistic children's imitation scores and their language abilities (Dawson & Adams, 1984; Sigman & Ungerer, 1984).

Interestingly, the fact that imitation impairments in autism have been found more consistently in younger than in older samples (Charman et al. 1997, 2003; Rogers et al., 2003; Morgan et al., 1989; Charman & Baron-Cohen, 1994) might indirectly reveal a developmental progress and possibly distinct developmental trajectory in the imitation abilities of autistic children over time.

1.3 Specificity of language impairment and SCS

This project addressed the issue of specificity of language impairment from the angle of a specific impairment of language that can be observed in children in contrast to impairments of children's language that occur in the course of global developmental disorders. This point of view determined the theoretical framework for the identification of participants for the clinical target groups (see section 2.2). The term specific language impairment (SLI) is applied "to a child whose language development is substantially below age level, for no apparent reason" (Bishop, 1997, p.19). The diagnosis of SLI incorporates a set of inclusionary criteria to determine a significant deficit in language ability as well as a set of exclusionary criteria which separate forms of global developmental disorders that directly affect language from SLI (Tomblin et al., 1996). Further, it is generally accepted that children who have been diagnosed with the umbrella term of SLI do not establish a homogeneous group, but show a wide range of language and communication strengths and weaknesses which change over time (Leonard, 1998).

But importantly, specificity of language impairment was not addressed in the framework of an underlying specific deficit in linguistic structures concerning the nature of the deficit in SLI. Theories which derived from this theoretical view regard a deficit in an innate module for

language, or more specifically for grammar, as cause for a SLI (Rice et al., 1995; van der Lely, 2005). Significantly, this language module is independent of other cognitive capacities and according to this SCS could not play a role in language acquisition. Accordingly, deficits in early SCS could not have an impact on language impairment and would be regarded as separate issues rather than involved issues.

This project derived from Chiat and Roy's (submitted) project to investigate the relation between deficits in early processing skills and later communicative and language impairments. Their investigation was rooted in the mapping theory (Chiat, 2001), which in contrast to grammatical theories focuses not on deficits in specific linguistic structures but on deficits in the complex mapping process as the heart of language acquisition. A child's acquisition of words entails the acquisition of connections between form and meaning which are specific to that language. To identify the form of sound patterns and units children must break down the stream of speech. They further must make sense of the world to identify meaning categories and relations. Accordingly, language impairments are due to specific breakdowns at some point of the mapping process. The phonological and sociocognitive hypotheses specify possible deficits in the mapping process which are hypothesised to have their roots in very early processing deficits (Chiat, 2001; Chiat & Roy, submitted).

The phonological hypothesis focuses on children's phonological processing skills and their role for the acquisition of lexical forms and syntactic structures. The hypothesis derived from the knowledge that children use phonological details such as stress patterns for the segmentation of words as well as for the identification of syntactic relations between words (Weissenborn & Höhle, 2001). It is hypothesised that constraints on children's processing skills affect their progress through the mapping process and therefore affect their lexical and syntactic development. The major interest of the phonological theory is the pattern of phonological deficit arising from the processing deficits rather than the manner in which the impairment has an effect across different levels of phonological processing. Children with phonological processing deficits are expected to show especially poor morphosyntactic abilities as well as deficits in the acquisition of words and syntax.

The sociocognitive hypothesis addresses the role of SCS as means to understand other person's intentional directedness behind their actions and utterances and further children's ability to use this knowledge as pragmatic cues for the acquisition of social communication and language. More specifically, children on the one hand use these skills to make sense of

the world and to extract meanings and on the other hand to connect these extracted meanings with phonological forms. Accordingly, it is hypothesised that constraints on SCS will affect the process of identifying the meaning of words as well as the mapping and recalling of connections between meanings and forms. This has most notably effects on the acquisition of social communication and language comprehension, but also on children's production of language, including words and sentences. Moreover it is expected that children with an exclusive surface outcome of morphologic and phonologic deficits should not display deficits in SCS.

Together, SLI is regarded as a disorder of multiple underlying processing deficits which may surface in similar looking problems. These different underlying deficits can either occur exclusively or cooccur in many different ways, whereby heterogeneous profiles of overlapping difficulties with language and communication can emerge between different impaired children. In addition, these patterns of impairment are not static and can change over time.

1.4 Aims

The main aim of this study was to explore whether, and to what extent, performance on a range of SCS differed between groups of young typically developing and language delayed children, taking age into account. Furthermore, it was intended to investigate whether the different SCS assessments, as expected, measure related abilities, inter alia to justify the construction of a SCS composite score. The study further sought to determine whether such a composite score is related to any specific language abilities within the clinical groups.
More specifically, this investigation was set out to address the following questions for all tasks and the SCS composite score:

- Will there be a difference between the 2 year old typical and clinical groups?
- Will there be a difference between the 3 year old typical and clinical groups?
- Will there be a difference between the 2 year old and 3 year old typical groups?
- Will there be a difference between the 2 year old and 3 year old clinical groups?
- Will there be a difference between the 2 year old typical and the 3 year old clinical groups?

2 Methodology

2.1 Research Design

The research project was a quasi-experimental 2x2 between-participants design. There were 2 independent factors in this study, each with 2 levels: age (2 years; 3 years) and group (typically developing; language delayed). All children were systematically assessed on a battery of tasks to measure 5 different SCS.

Analyses of variance were planned to identify whether there is a difference between the 2 and 3 year old clinical and control groups. Correlation analysis were intended to determine whether the different SCS assessments measure related abilities and whether SCS composite scores and linguistic abilities are related. Due to violations of the underlying assumptions of normality and homogeneity in some data-sets, the planned analysis of variance could not be calculated in all instances. Instead of the Factorial ANOVA, Welch-Satterthwaite corrected independent t-tests and nonparametric Mann-Whitney-U tests were chosen to compare performance between groups on the different SCS assessments.

2.2 Participants

2.2.1 Selection criteria

To take part in this study, children in both groups had to meet following criteria:

- aged between 2;6 and 3;11 years (female and male)
- normal motor development
- no known hearing loss, physical, neurological or congenital illness
- no diagnosis of autism
- no general nonverbal cognitive delay or disorder (nonverbal IQ $\geq$ 80)
- monolingual German-speaking
- no phonological deficits which considerably affected a child's intelligibility
- no diagnosis of stuttering or exclusive social communication impairment
- premature children, if they met above criteria, were included in typical as well as in clinical groups.

Children in the clinical groups additionally had to meet the criteria of delayed language development. Participants were defined as language delayed when they performed

- at least –1.25 SD down on one and –1.5 SD on another subtest or
- at least –2.0 SD down on one subtest

of 4 assessed subtests of a standardised language test. Furthermore these language skills had to be at least 1 SD below nonverbal IQ as assessed on a standardised measure. To obtain clear control groups, children were excluded from the typical groups if they scored above the criterion of delayed language but below -1.25 SD on at least two subtests in a standardised language assessment.

The relation between children's phonological and SCS was not addressed in this project. Consequently, the only concern about phonological abilities was to avoid possible confounding of performance on productive tasks of the language assessments. Therefore phonological delay and consistent phonological disorders were accepted unless they disrupted the intelligibility of a child.

Children were recruited from 3 nurseries and 6 practices for speech and language therapy in the area of Magdeburg in Germany which agreed to be involved in this project (see Annex C-F). Participants were recruited in person through nursery staff and speech and language therapists who identified parents of children matching the defined selection criteria in the required age group. Parents who had expressed an interest to participate in the investigation were given an information sheet, consent form and questionnaire to be completed and returned (see Annex G-I).

2.2.2 Age, gender and socioeconomic background of participants

Altogether 44 children were included in the whole sample, of whom 57 % were boys and 43 % were girls. Children came from a range of socioeconomic backgrounds: 71% of the parents of language delayed children had completed a nonacademic professional training and 29 % achieved an academic degree, whereas 61% of the parents of the control children had completed a nonacademic professional training and 39% were educated to graduate level or above.

Two different age bands were defined in this study. Due to the age banding in available assessments the first age band consisted of 6 months (2;6 to 2;11 years), the second age band of 12 months (3;0 to 3;11 years). Table 2.1 gives a detailed overview of age and gender distribution for all different groups. As is evident in this table, age distribution in the clinical and typical groups was similar.

An independent samples t-test was conducted between the age means and revealed no difference between the 2 year old (t=.096, df=15.52, p=n.s.) or 3 year old groups (t=.89, df=20.86, p=n.s.).

Table 2.1: Number of total participants, age-means, SDs and age-ranges as well as number of females and males of each group

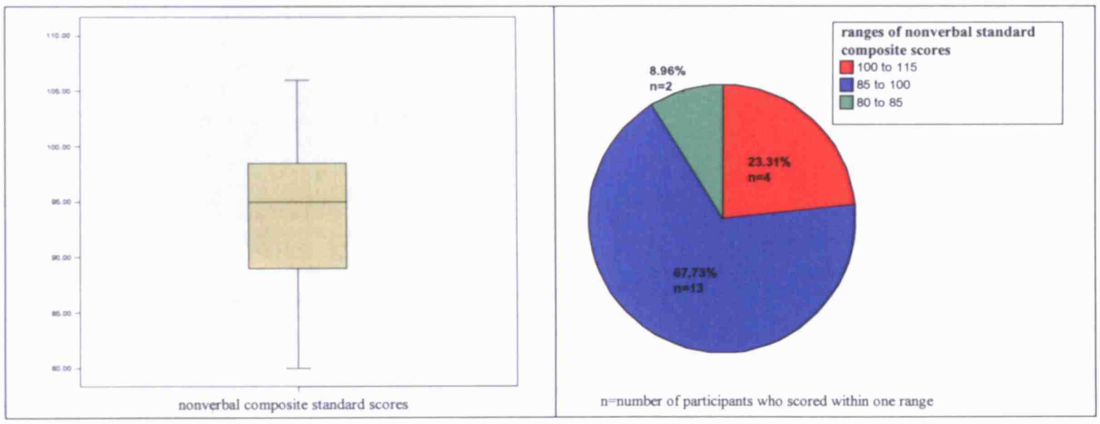
Group	N	mean age *	SD	Range (max = 12)		female (N)	male (N)
				Min	Max		
2 year typical	10	31.70	1.70	30	34	5	5
2 year clinical	8	31.62	1.59	30	34	3	5
3 year typical	15	40.73	3.69	37	48	6	9
3 year clinical	11	42.09	3.95	37	47	5	6

***in months**

2.2.3 Nonverbal cognitive abilities, preterm birth and severity of language delay in the clinical group

Distribution of nonverbal abilities

Figure 2.1: Distribution of nonverbal composite standard scores within the clinical group



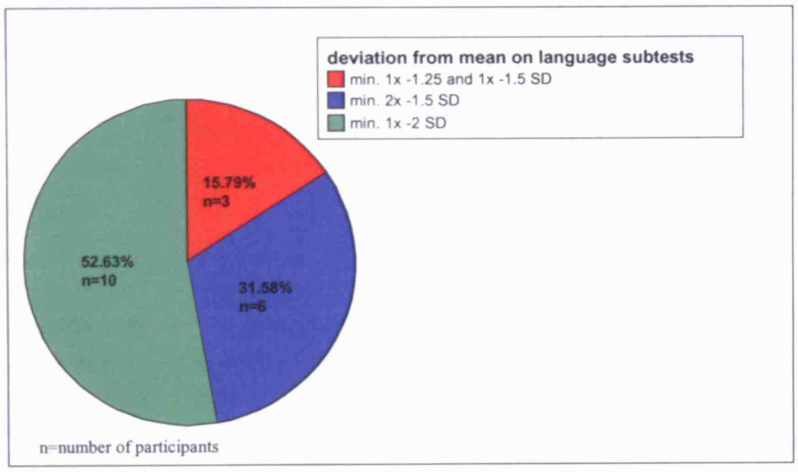
All clinical children (N=19) attained standard scores between 80 and 106 (mean=100 and SD=15) on the Special Nonverbal Composite of the British Ability Scales II (Elliott et al., 1996). The mean nonverbal IQ of the group was 93.94 with a SD of 7.77. Thus, the majority of children received a nonverbal composite standard score within 1 SD (≥ 85) of the mean but 2 children scored 1.33 SD below the mean (see figure 2.1). Importantly, these 2 participants scored below –2.5 SD in at least one subtest of the standardised language assessment and therefore more than 1 SD below their nonverbal IQ. Consequently, the criteria for specific developmental language disorders were not violated (World Health Organisation, 1993, cited in Bishop, 1997). Altogether 3 prematurely born participants were included in the clinical groups. Two children scored above 85 and one child scored 80 on the nonverbal intelligence

measure. The criteria of 1 SD difference between nonverbal abilities and language skills were fulfilled for all participants.

Distribution of language performance

In this project a child was categorised as language delayed when she scored at least –1.25 SD on one and –1.5 SD on another or –2.0 SD below the mean on one subtest of a standardised language test. Figure 2.2 gives a breakdown of children scoring on language subtests within the clinical group and shows that the majority of clinical participants scored at least –2 SD below the mean on one language subtest. 26% of the language delayed children already had started language therapy, but only one child had received more than 10 individual therapy lessons.

Figure 2.2: Distribution of severity of language delay: Categorised through SDs from the mean on children's performance on a standardised language test



2.3 Assessments

2.3.1 SCS

The SCS assessments include 5 novel tasks to measure a range of SCS which are predicted to be related to early language development (see table 2.2). The battery is composed of the Test of Early Social Cognition (Chiat & Roy, in preparation) which was developed for the authors ESRC-funded research project to investigate early processing skills as predictors of later language disorders and 2 imitation assessments which were specifically designed for this project. For the purpose of some analyses, the 3 separate scores of the Test of Early Social Cognition (Chiat & Roy, in preparation) and the actions on objects imitation scores were added to one SCS composite raw score. All assessments which are outlined in the following take the form of games and were designed to maximise young children's engagement.

Table 2.2: The 5 different SCS assessments

	Test of Early Social Cognition (Chiat & Roy, in preparation)			**Imitation assessments**	
Assessment	Social Responsiveness	Joint Attention	Symbolic Comprehension	Imitation of actions on objects	Imitation of gestures
Task	measures child's gaze at an adult's face following the adult's expressions of emotion in response to a series of events	measures a child's gaze switch from object to adult and monitoring of adult's gaze towards an object	measures child's understanding of different levels of symbolic representation	measures a child's spontaneous and elicited imitation of actions on objects modelled by an adult	measures a child's direct imitation of gestures modelled by an adult
Items	6 short scenarios to express 6 different emotions	6 miniature objects inside 6 eggs which correspond to 6 larger objects placed around the room	1) mapping of 6 presented gestures to real objects 2) mapping of 6 miniature objects to real objects 3) mapping of 2x3 substitute objects to real objects	simple sequence of 6 linked meaningful actions on objects	4 meaningless and 4 meaningful gestures
Score	child's responsiveness is scored through points in terms of looks to the assessor's face	child's joint attention is scored through points in terms of gaze switch and gaze monitoring	child's symbolic comprehension is scored through points for each object that is correctly selected in each condition	child's imitation is scored through points for each of the modelled actions attempted	child's imitation is scored through points for each of the modelled gestures attempted
Composite score	separate raw scores of these 4 assessments were combined to one SCS composite raw score				

The Test of Early Social Cognition

The Test of Early Social Cognition (Chiat & Roy, in preparation) consists of 3 nonverbal tasks to assess the SCS of social responsiveness, joint attention and symbolic comprehension (see Annex A).

The *social responsiveness assessment* extends a procedure created by Sigman et al. (1992). Equipped with a bag of 6 necessary props the investigator acts out a sequence of 6 short scenarios. Through each scenario a different emotion such as hurt or fear is expressed and the child's responsiveness is scored in terms of looks to the researcher's face, either fleeting (1 point) or for at least 2 seconds (2 points).

In the *joint attention assessment* child and assessor are focussed on a box of six plastic eggs. Each egg contains a miniature object like a tiny hat or bag. A corresponding lager version of each object was placed to the side, front and back of the child prior to the session. The child's alternating gaze between egg and investigator's face is scored (1 point) whilst an egg is first shaken to one side of the person's face and then opened in front of the child. The child's monitoring of the assessor's direction of gaze (2 points) or the assessor's finger-point (1 point) towards the corresponding object around the room is scored. The procedure is then repeated with the next egg.

The *symbolic comprehension task* is based on a procedure constructed by Tomasello et al. (1999) and investigates in 3 conditions children's abilities to understand different levels of symbolic representation. In each condition the examiner uses symbolic representations for real objects: first gestures, secondly miniature replicas and thirdly substitute objects. The child is asked to select an object from a set of 6 corresponding to the symbolic representation and to slide it down a chute. Before the first condition is carried out, the procedure of selecting a real object and rolling it down the chute was practiced with each participant. Children's skills in mapping symbolic representations to real objects are scored through 1 point for each correctly chosen target object.

The imitation assessments

These 2 assessments measure a child's skills in imitating symbolic gestures and actions on objects[1] modelled by an adult (see Annex B). In the first task, imitation of actions on objects, the examiner demonstrates a simple sequence of 6 linked meaningful actions on objects, for example a toy mouse jumping from a chair into a bowl of water. Each action is accompanied by a non-linguistic expression, either an onomatopoeic sound or exclamation. After the child has been introduced to play with the adult, the episode is modelled twice, once without an instruction to score the child's spontaneous attempt to imitate (2 points), and then attended by invitations of the mouse 'to do as she does' to elicit the child's action (1 point). The second task, gesture imitation, is based on a procedure developed by Bekkering et al. (2000) and Gattis et al. (2002) and investigates the elicited imitation of 8 simple gestures; 4 meaningless body movements (for example lifting both arms straight over the head) and 4 meaningful gestures (for example flying with the arms like a bird). In this part, the examiner directly asks the child to do as she does before demonstrating one gesture after the other. Children's

[1] in the following termed 'object imitation'

immediate attempt to imitate a gesture is awarded 2 points, and their effort to imitate after the examiner's second invitation 1 point.

More specifically, an attempt to imitate was determined as a child's goal directed attempt to do as the other person does whereby the action performed by the child does not exactly has to match the action modelled by the adult. But it is important to distinguish between a goal directed action and a completely unrelated action like lifting a finger which could just be carried out by accident. The latter would not be regarded as attempt to imitate and accordingly would not be scored through points.

2.3.2 Language and nonverbal abilities

The tests of language and nonverbal ability listed in table 2.3 were conducted with all clinical children to ensure the selection criteria were fulfilled and to assess the relationship between SCS and different aspects of language. They are described briefly below.

Table 2.3: Assessments to measure language and nonverbal abilities

	BAS	BAS	SETK 2	SETK 3
Age range	2;6 – 3;5	3;6 – 5;11	2;0 – 2;11	3;0 – 3;11
Subtest 1	Block building	Picture similarities	Word comprehension	Sentence comprehension
Subset 2	Picture similarities	Pattern construction	Sentence comprehension	Use of morphological plural markers
Subtest 3	-	Copying	Word production	Verbal encoding of semantic relations
Subtest 4	-	-	Sentence production	Phonological memory
Composite score	Nonverbal composite standard score (lower level)	Nonverbal composite standard score (upper level)	No composite standard score	No composite standard score

British Ability Scales Second Edition (BAS II)

The BAS II (Elliott et al., 1996) is a battery of tests measuring children's cognitive skills and educational achievements which was standardised on English-speaking children. The Special Nonverbal Composite, a battery composed of nonverbal tasks, was used to measure children's nonverbal abilities in this study. The lower level of this special battery includes 2 subtests, and the upper level consists of 3 different subtests (see table 2.3). To date, an appropriate nonverbal test with standardised values from German-speaking children between the age of 2;6 and 3;0 years has not been published in Germany. Therefore this British assessment was chosen and translated into German. Since these nonverbal assessments were administered with a minimum use of verbal instructions, standard scores were assumed to be also valid for the population of German-speaking children.

Sprachentwicklungstest für zweijährige Kinder (SETK 2) and Sprachentwicklungstest für dreijährige Kinder(SETK 3)

Language was assessed using the SETK 2 (Grimm, 2000) and the SETK 3 (Grimm, 2001). Both are standardised tests which were constructed to measure children's general stage of language development at 2 years (SETK 2) and at 3 years (SETK 3). The SETK 2 includes 2 subtests to assess a child's receptive language competence at word and sentence level as well as 2 subtests to diagnose a child's word and sentence production. The sentence task is analysed in terms of semantic, syntactic and morphological encoding of events. The SETK 3 measures the comprehension of sentences, the use of morphological plural markers and the verbal encoding of visualised events. Unlike the SETK 2, syntactic and morphological performance is not considered for the scoring of this subtest. In addition to the analysis of linguistic competences, children's phonological memory skills are assessed.

2.3.3 Parental questionnaire

A questionnaire was handed out to all parents to collect background information about children's language, cognitive and general development as well as their socioeconomic background to allow control for confounding factors and influencing variables, respectively. It was adapted from a questionnaire by Fricke and Schäfer (2005). Only the clinical children were systematically assessed on a standardised language test and a nonverbal intelligence measure, but cognitive, language and general developmental issues of the typical children were checked by means of this parental questionnaire. However, if any doubts about a child's development emerged, additional necessary tests were conducted.

2.4 Procedure

All children were assessed individually in their nursery or speech and language practice. During the data collection most of the typically developing children were seen once for 30 to 45 minutes to conduct the SCS assessments. The clinical children were seen approximately 3 times for 30 to 45 minutes to carry out all measures. Every session started with a brief warm-up chatting to the child before the children were introduced to the measure. The SCS assessments were administered in a fixed order, designed to keep young children engaged, but pace of tasks was determined by the child. A parent or another carer could attend the test sessions. The data collection was video recorded if parents gave permission in order to allow independent checks on reliability of scoring.

3 Results

3.1 Scoring reliability

To ensure reliability of scoring for the SCS tasks, an experienced speech and language therapist blindly to the status of children watched and rescored 10% of the measures from typical as well as clinical children, using the same criteria. The percentage of agreement between the investigator and the independent evaluator was calculated for each measure, and agreement ranged from 91% - 100%. The percentage of disagreement was under 10% and therefore acceptable. Table 3.1 illustrates percentage of agreement for each assessment and the SCS composite score.

Table 3.1 Percentage of scoring-agreement between the investigators for each subassessment

Sociocognitive assessments	Percentage of agreement
Social responsiveness	100%
Joint attention	91%
Symbolic comprehension	97.4%
Object imitation	92.3%
Gesture imitation	98%
Composite score	99.5%

3.2 Quantitative analysis

3.2.1 Relationships between different SCS tasks

The novel SCS measures were developed as 5 different tasks which are scored individually, but for further analyses the creation of a SCS composite score was aimed. Previous research has revealed relations between SCS and accordingly a relation between all tests was expected. To analyse if the different SCS assessments measured related abilities, it was planned to calculate correlations between each possible combination of tasks. Therefore all sets of data from all groups were combined for analysis of correlation between the social responsiveness, joint attention, symbolic comprehension and object imitation test. Due to the exceptional variance of individual scores on the gesture imitation test (see below), the data from this measure was not included in the SCS composite score. Inspection of performance on the 4 other tasks indicated that all sets of data did not deviate substantially from a normal distribution although displaying some evidence of negative skew. Furthermore two outlier, 1 in the joint attention and 1 in the symbolic comprehension data-set, were apparent but not removed with regard to the sample size. Despite these divergences from normality Pearson's product moment correlation was chosen, justified through the equality of group sizes. Table 3.2 shows the means, SDs and ranges for raw scores on the 4 SCS tasks.

Table 3.2 Means, SDs and ranges for raw scores of all participants (N=44) on 4 different tasks

Task	N	Mean	SD	Range	
				Min	Max
Social responsiveness	44	9.97	2.11	4	12
Joint attention	44	14.77	2.55	7	18
Symbolic comprehension	44	10.88	3.57	2	17
Object imitation	44	8.95	2.72	3	12

To examine if the same linear relationship was evident for the groups of 2 and 3 year old children between any two tests, scattergrams of raw scores for all possible pairs of tasks were plotted. They revealed that the relationship between some tests did change with age (see figure 3.1). Consequently 6 partial correlations controlling for age were conducted between raw scores of all combinations of measures.

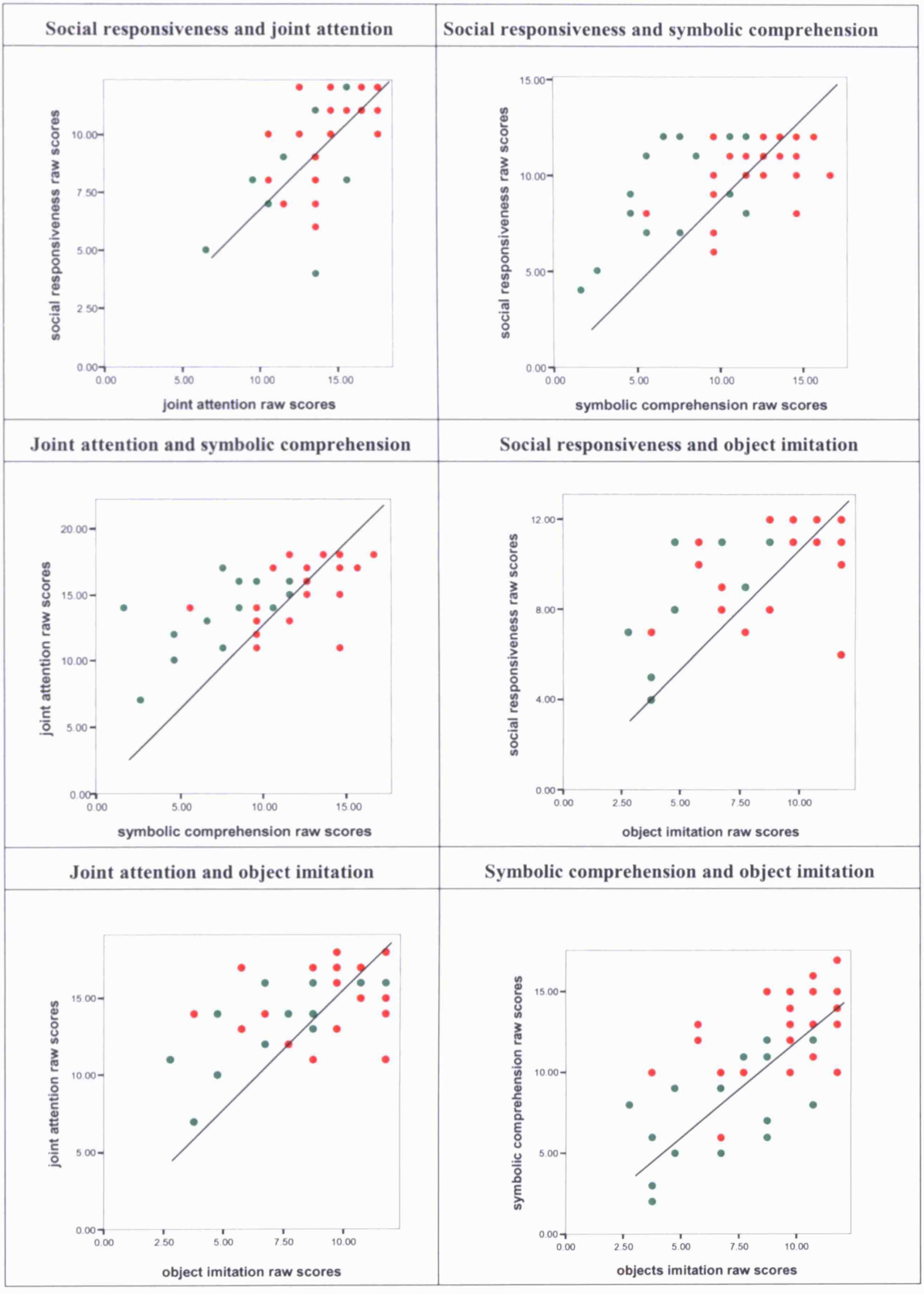
All scores were significantly, positively and moderately correlated. The size of correlation coefficients ranged from r=.44 for the relation between joint attention and object imitation to r=.60 for the relation between social responsiveness and object imitation. Variables were either significant at the .001 or .005 level (see table 3.3). Therefore the null hypothesis that the scores of different tests would be completely independent could be rejected in all cases. The size of the correlation coefficients confirmed that the different SCS assessments measured related abilities. This justified the formation of a composite score in terms of construct validity.

Table 3.3: Partial correlation coefficients of raw scores from all participats (N=44) for all possible pairs of tasks controlling for age

	Joint attention	Symbolic comprehension	Object imitation
Social responsiveness	.598***	.602***	.607***
Joint attention		.546***	.436**
Symbolic comprehension			.564***

*** variables significant at ** p<.005 and *** p≤.001**

Figure 3.1: Scatterplots of raw scores from all participants (N=44) for all possible pairs of tasks (green= 2 year old children; red= 3 year old children)



3.2.2 Differences between typical and clinical groups on all SCS tasks taking age into account

The main aim of this project was to investigate whether, and to what extent, performance on the 5 different SCS measures differed between the clinical and the control groups, taking age into account. In this section results of statistical analyses comparing groups for each single SCS test as well as for the SCS composite score are presented. First descriptive statistics of each task are outlined to justify the chosen statistical methods for all conducted comparisons. Due to violations of the underlying assumptions of normality and homogeneity in some data-sets, the planned analysis of variance could only be calculated in one instance.

Social responsiveness

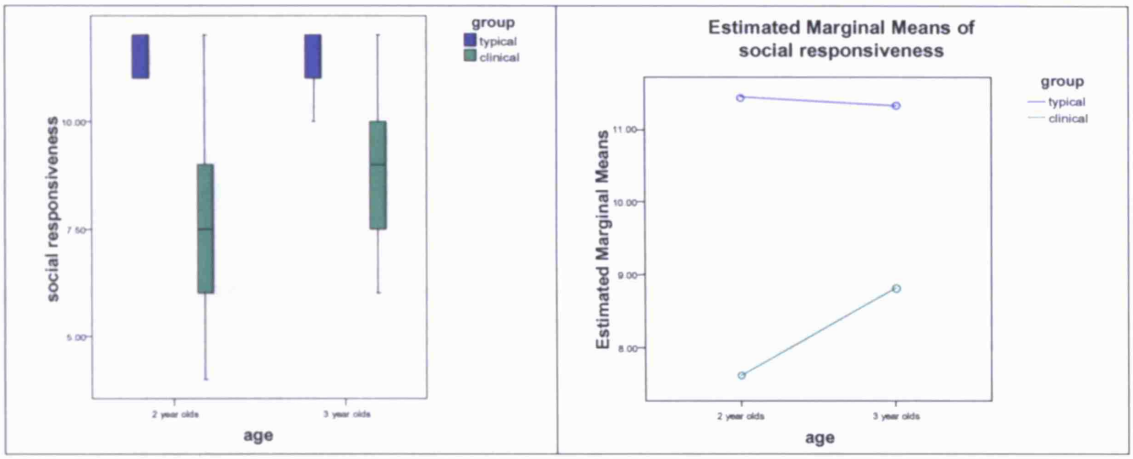
Table 3.4 shows the means, SDs, and range of scores for typical and clinical groups, figure 3.2 illustrates the spread of individual scores and the group-means for all samples. Inspection of the data showed that scores of the two clinical samples were normally distributed and revealed no significant deviation from normality in the Kolmogorow-Smirnov test whereas the data-sets of both typical samples displayed clear evidence of ceiling effects. Levene's test for homogeneity of variance was significant, thus the assumption of homogeneity was violated. Along with the fact that sample sizes were not equal the implementation of a Factorial ANOVA for independent groups was not appropriate. As ceiling effects influence non-parametric as well as parametric tests, 5 Welch-Satterthwaite corrected independent t-tests were alternatively conducted to analyse the experimental hypotheses concerning performance on the social responsiveness task.

Table 3.4: Means, SDs and ranges for raw scores of each group on the social responsiveness task

Group	N	Mean	SD	Range (max = 12)	
				Min	Max
2 year typical	9*	11.44	0.52	11	12
2 year clinical	8	7.62	2.50	4	12
3 year typical	15	11.33	0.61	11	12
3 year clinical	11	8.81	1.77	6	12

***1 outlier removed**

Figure 3.2: Boxplots and plot of estimated marginal means for all groups on the social responsiveness task



As predicted the differences between the typical and clinical groups were highly significant for the 2 year olds (t=4.23, df=7.55, p<.005) as well as for the 3 year olds (t=4.49, df=11.77, p≤.001) and even the 2 year old control group performed significantly better on the social responsiveness task than the 3 year clinical group (t=4.65, df=12.08, p≤.001). In contrast, no effects of age were found (see table 3.5).

Table 3.5: Group differences on the social responsiveness measure (independent t-tests)

	2 year typical versus 2 year clinical	3 year typical versus 3 year clinical	3 year typical versus 2 year typical	3 year clinical versus 2 year clinical	2 year typical versus 3 year clinical
t*	4.23	4.49	-.46	1.15	4.65
df	7.55	11.77	19.16	11.95	12.08
p value	<.005	≤.001	n.s.	n.s.	≤.001

*** values quoted for equal variances not assumed (n.s.=not significant)**

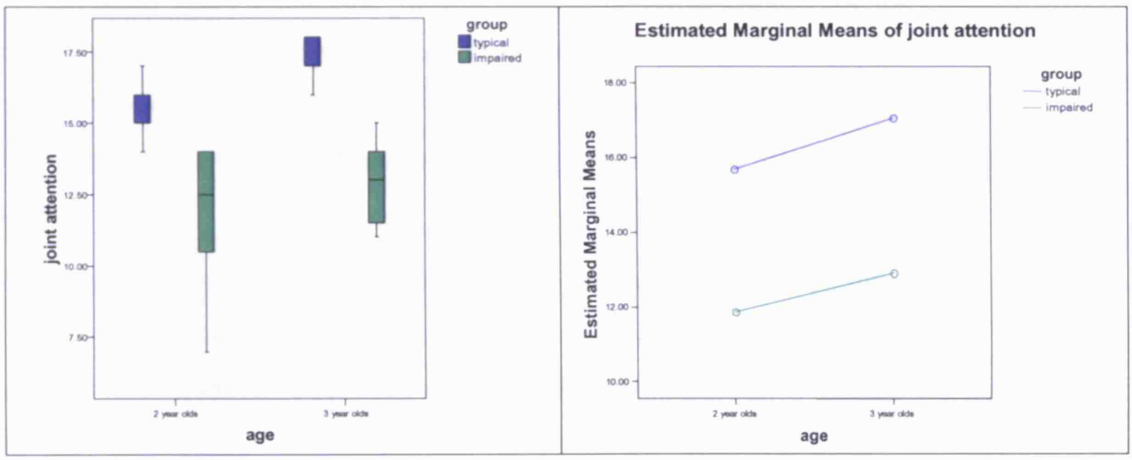
Joint attention

Descriptive statistics revealed that scores of the 2 year old control group were not normally distributed and that the sample of the 3 year old control group scored near ceiling (see table 3.6 for descriptive details and figure 3.3 for drawn boxplots and group-means of all data-sets). Since Levene's test of homogeneity of variance displayed unequal error variances between the samples, neither the assumptions of the Factorial ANOVA nor of the independent t-test were fulfilled. Therefore the nonparametric Mann-Whitney-U test was chosen to compare performance on the joint attention task.

Table 3.6 Means, SDs, medians and ranges for raw scores of each group on the joint attention task

Group	N	Mean	SD	Median	Range (max =18)	
					Min	Max
2 year typical	10	15.70	.98	16.0	14	17
2 year clinical	8	11.87	2.47	12.5	7	14
3 year typical	15	17.06	1.30	17.5	15	18
3 year clinical	11	12.90	1.44	13.0	11	15

Figure 3.3: Boxplots and plot of estimated marginal means for all groups on the joint attention task



Again, the results showed highly significant differences at the .001 significance level between clinical and control groups for both age bands as well as for scores between the samples of 2 year old typically developing and 3 year old clinical children (see table 3.7). As predicted there was no significant improvement of performance on the joint attention task between the 2 and 3 year old clinical groups (u=34.00, z=-.85., n.s.), but contrary to expectations based on previous research the 3 year old typical children performed significantly better on the joint attention task than the 2 year old typical children (u=25.50, z=-2.83, p<.005).

Table 3.7: Group differences on the joint attention measure (Mann-Whitney-U tests)

	2 year typical versus 2 year clinical	3 year typical versus 3 year clinical	3 year typical versus 2 year typical	3 year clinical versus 2 year clinical	2 year typical versus 3 year clinical
u	3.00	1.00	25.50	34.00	6.50
z	-3.35	-4.29	-2.83	-.85	-3.48
p value	≤.001	≤.001	<.005	n.s.	≤.001

(n.s.=not significant)

Symbolic comprehension

Table 3.8 displays the means, SDs, and range of scores for typical and clinical groups, figure 3.4 illustrates the spread of individual scores as well as the group-means for all samples. Three of the 4 data-sets for the symbolic comprehension task did not deviate significantly from a normal distribution but the data of the 3 year old clinical group showed a significant deviation from normality in the Kolmogorow-Smirnov test. Because Levene's test proved that error variances of the dependent variable were equal across groups, and the Factorial ANOVA for between groups is furthermore known to be robust enough to balance small violations of the assumptions (Field, 2005), the F-test was implemented to statistically analyse the following experimental hypotheses regarding performance on the symbolic comprehension measure:

a) The typical groups perform higher than the clinical groups (factor group).
b) The 3 year old groups perform higher than the 2 year old groups (factor age).
c) There is an interaction between age and group (interaction).

Hypotheses for additional post-hoc comparisons:

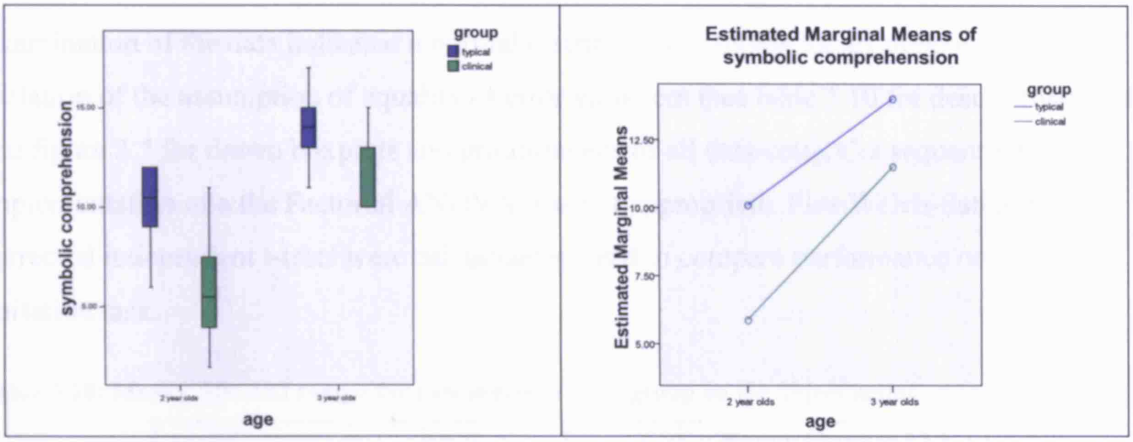
d) There is no difference in the performance between the 3 year old clinical group and the 2 year old typical group.
e) The 3 year old typical group performs better than the 3 year old clinical group.

Table 3.8: Means, SDs and ranges for raw scores of each group on the symbolic comprehension task

Group	N	Mean	SD	Range (max = 18)	
				Min	Max
2 year typical	10	10.10	2.07	8	12
2 year clinical	8	5.87	2.85	2	11
3 year typical	15	14.00	1.55	12	16
3 year clinical	10*	11.50	2.12	10	15

***one outlier removed**

Figure 3.4: Boxplots and plot of estimated marginal means for all groups on the symbolic comprehension task



The main effect of group as well as the main effect of age were both found to be highly significant (please see table 3.9). But contrary to the stated hypothesis c) there was no significant interaction between the factors of group and age (F=1.74, df=1, p=n.s.), due to a parallel improvement between the 2 and 3 year old clinical and typical groups. Accordingly, the post-hoc comparison between the groups of 3 year olds revealed a significant difference (t=3.40, df=23, p<.005). On the other hand, there was no significant difference between the 2 year old control group and the 3 year old clinical group (t=-1.49, df=18, p= n.s.).

Table 3.9: Results of between subject effects (F-test) and post-hoc comparisons (t-test) for the symbolic comprehension task

Between subjects effects (F-test)	**F**	**df**	**p value**
Group effect	26.44	1	≤.001
Age effect	53.05	1	≤.001
Interaction group * age	1.74	1	n.s.
Post-hoc comparisons (t-test) +	t	df	Alpha level *
3 year olds typical versus 3 year olds clinical	3.40	23	<.005
2 year old typical versus 3 year olds clinical	-1.49	18	n.s.

+t-values quoted for equal variances not assumed (n.s.=not significant)
***a difference will be considered as significantly at the chosen alpha level < .025**

Object imitation

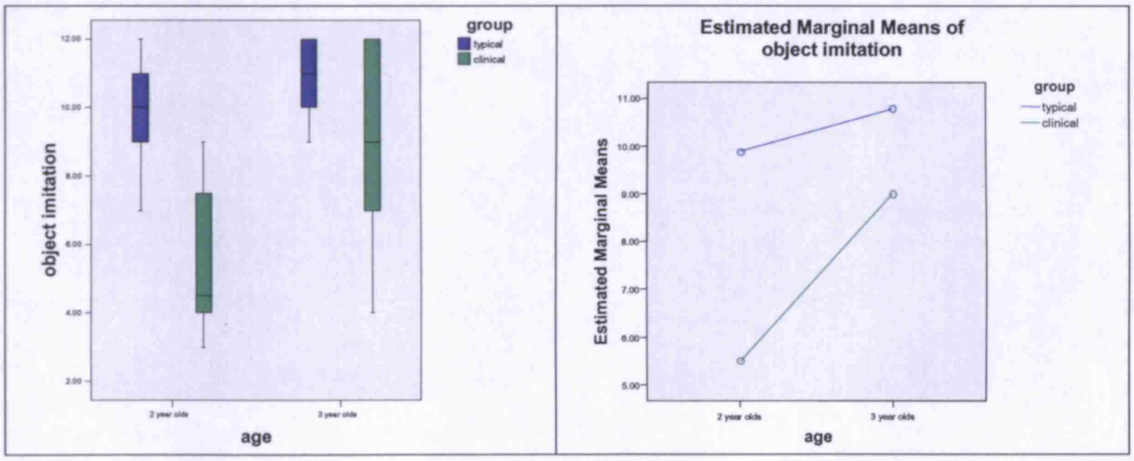
Examination of the data indicated a normal distribution of scores for all samples but a violation of the assumption of equality of error variances (see table 3.10 for descriptive details and figure 3.5 for drawn boxplots and group-means of all data-sets). Consequently the implementation of a the Factorial ANOVA was not appropriate. Five Welch-Satterthwaite corrected independent t-tests were calculated instead to compare performance on the object imitation task.

Table 3.10: Means, SDs and ranges for raw scores of each group on the object imitation task

Group	N	Mean	SD	Range (max = 12)	
				Min	Max
2 year typical	9*	9.88	1.53	7	12
2 year clinical	8	5.5	2.20	3	9
3 year typical	14*	10.78	0.97	9	12
3 year clinical	11	9.0	2.82	6	12

***one outlier removed**

Figure 3.5: Boxplots and plot of estimated marginal means for all groups on the object imitation task



As shown in table 3.11, highly significant difference between the performance of the 2 year old typical and clinical children was found (t=4.70, df=12.34, p≤.001) but scores of the 3 year old typical and clinical groups did not differ (t=2.00, df=11.87, p=n.s.). Furthermore, contrary to hypothesis, there was no difference between the 3 year old clinical group and the 2 year old control group (t=.89, df=15.92, p=n.s.). There was a clear and significant improvement with age in the outcomes of the 2 year old in contrast to the 3 year old clinical children (t=3.03, df=16.87, p<.01) but no improvement with age between the outcomes of the 2 and 3 year old typical children (t=1.56, df=12.17, p=n.s.).

An interaction between the factor of age and group would had been expected, but due to nature of the data this hypothesis cannot be statistically analysed. Strikingly, no child refused completely to engage in this task.

Table 3.11: Group differences on the object imitation measure (independent t-tests)

	2 year typical versus 2 year clinical	3 year typical versus 3 year clinical	3 year typical versus 2 year typical	3 year clinical versus 2 year clinical	2 year typical versus 3 year clinical
t*	4.70	2.00	1.56	3.03	.89
df	12.34	11.87	12.17	16.87	15.92
p value	≤.001	n.s.	n.s.	<.01	n.s.

***values quoted for equal variances not assumed (n.s.=not significant)**

Gesture imitation

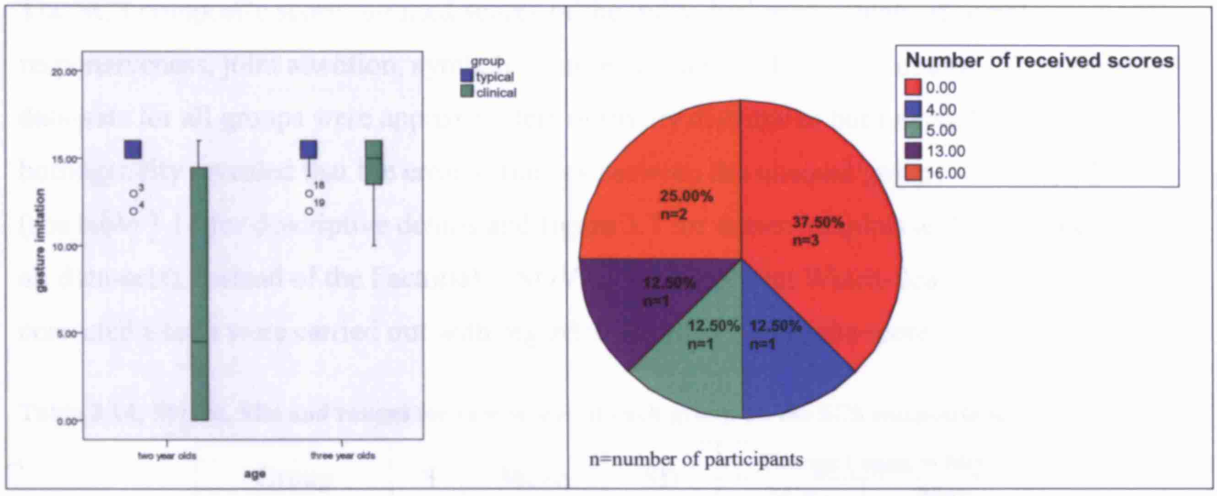
Table 3.12 shows the means, SDs, medians and ranges for scores of each group on the gesture imitation task. Three of the 4 data-sets displayed a strong negative skew and all samples indicated significant deviation from normality in the Kolmogorow-Smirnov test. Outlier were apparent in the in the boxplots of the control groups (see figure 3.6) and error variances between the groups were not homogeneous at all. The most striking aspect of the data was the exceptional variance of individual scores within the group of 2 year old clinical children, (see pie chart in figure 3.6). 62.5% of the 2 year old clinical children either refused to imitate any gesture or received the maximum number of scores, while just 37.5% of the children obtained intermediate scores. Regarding the quantitative analyses 5 Mann-Whitney-U tests were carried out to examine the experimental hypotheses.

Table 3.12: Means, SDs, medians and ranges for raw scores of each group on the gesture imitation task

Group	N	Mean	SD	Median	Range (max = 16)	
					Min	Max
2 year typical	9*	15.11	1.53	16.0	12	16
2 year clinical	8	6.75	7.14	4.5	0	16
3 year typical	15	14.87	1.64	16.0	12	16
3 year clinical	11	14.12	2.35	15.0	10	16

***one extreme outlier removed**

Figure 3.6: Distribution of individual scores of all samples (boxplots) and within the group of 2 year old clinical children (pie chart)



Results for the gesture imitation task produced the same picture as results for the object imitation task, even though at different significance levels (see table 3.13). Regarding the factor group, a significant difference was found between the 2 year old clinical and control groups (u=13.5, z=-2.29, p<.05) but the difference of the performance between the typical and clinical 3 year old groups was not significant (u=60.0;z=-1.33, p=n.s.). This is in line with the findings concerning the factor age, where again a significant difference between both age bands of clinical children became apparent (u=19.5, z=-2.08, p<.05), but no significant different between the age bands of typical children (u=63.0, z=-.33, p=n.s.), nor between the 2 year old control group and the 3 year old clinical group (u=38.5, z=-.91, p=n.s.).
Concerning the group of 2 year old clinical children the qualitative analysis, which identified numbers of refusal, turned out to be very informative about the severity of language delay as all children who did not try to imitate any gesture scored 2 SD below the age mean in at least two subtests of the standardised language measure. This suggested that refusal may be due to deficit rather than uncooperativeness. Interestingly, no other child in any other group completely refused to imitate any gesture. Furthermore, comparison of children's performance on meaningful versus meaningless gestures revealed no differences between these.

Table 3.13: Group differences on the gesture imitation measure (Mann-Whitney-U tests)

	2 year typical versus 2 year clinical	3 year typical versus 3 year clinical	3 year typical versus 2 year typical	3 year clinical versus 2 year clinical	2 year typical versus 3 year clinical
u	13.50	60.00	63.00	19.50	38.50
z	-2.29	-1.33	-.33	-2.08	-.91
p value	<.05	n.s.	n.s.	<.05	n.s.

(n.s.=not significant)

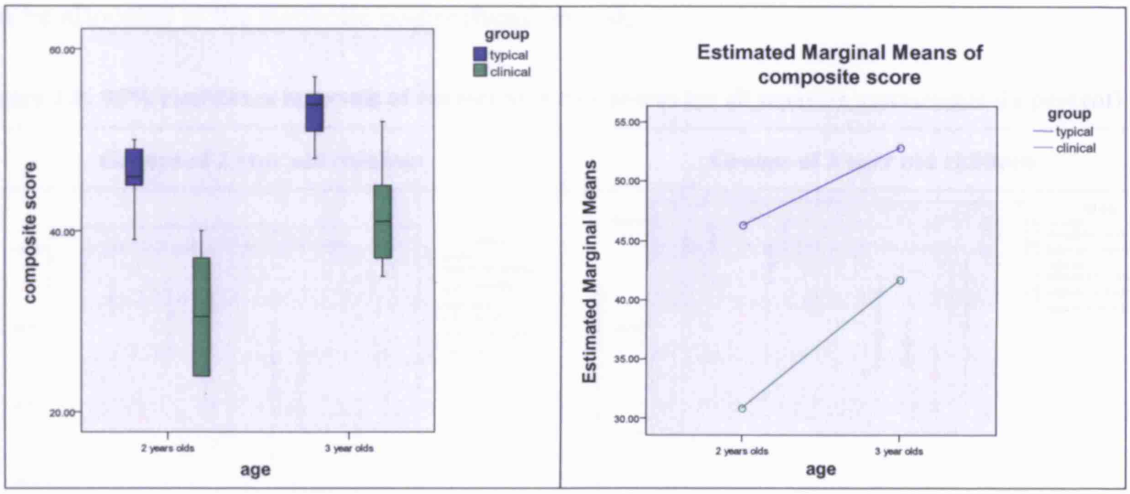
SCS Composite score

The SCS composite score summed scores of the individual assessments of social responsiveness, joint attention, symbolic comprehension and object imitation. The resulting data-sets for all groups were approximately normally distributed but Levene's test for homogeneity revealed that the error variances between the unequal groups were significant (see table 3.14 for descriptive details and figure 3.7 for drawn boxplots and group-means of all data-sets). Instead of the Factorial ANOVA, 5 independent Welch-Scatteterthwaite corrected t-tests were carried out with regard to the SCS composite score.

Table 3.14: Means, SDs and ranges for raw scores of each group on the SCS composite score

Group	N	Mean	SD	Range (max = 60)	
				Min	Max
2 year typical	10	46.30	3.12	39	50
2 year clinical	8	30.87	6.57	24	40
3 year typical	15	52.86	2.61	48	56
3 year clinical	11	41.72	5.49	35	52

Figure 3.7: Boxplots and plot of estimated marginal means for the SCS composite score of all groups



As can be seen in table 3.15 the results of all t-tests were significant, at least at the .05 significance level. Both typical groups performed significantly better on the SCS composite scores than the clinical groups and both older age groups received significantly higher scores than the younger age groups. Additionally it was found that even the 3 year old clinical group obtained lower SCS composite scores than the 2 year old control children.

Table 3.15: Group differences on SCS composite score (independent t-tests)

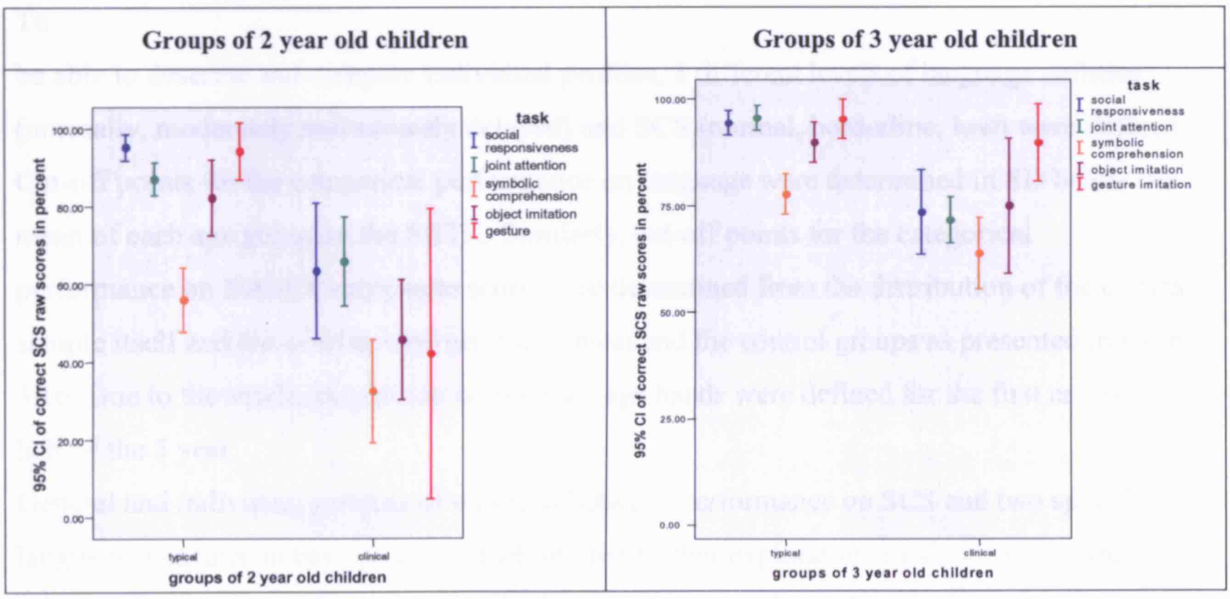
	2 year typical versus 2 year clinical	3 year typical versus 3 year clinical	3 year typical versus 2 year typical	3 year clinical versus 2 year clinical	2 year typical versus 3 year clinical
t*	6.10	6.22	5.48	3.80	2.36
df	9.52	13.33	16.96	13.48	16.12
p value	≤ .001	≤.001	≤.001	< .005	<.05

***values quoted for equal variances not assumed**

Comparison of group profiles of different SCS tasks

Additionally, the overall picture of 95% confidence intervals of performance on all SCS assessments for typical and clinical groups was plotted, separately for 2 and 3 year olds. Figure 3.8 highlights the finding that in general the group means for different SCS assessments of the 3 year olds cluster much more closely than those of the 2 year olds. The widest spread of individual scores could be found within the groups of the 2 year old language delayed children. The most potential for further development, even for the 3 year old children, can be allocated to the symbolic comprehension task.

Figure 3.8: 95% confidence intervals of correct SCS raw scores for all separate assessments (in percent)



3.3 Relations between language and SCS

To explore the relation between language abilities and SCS, participants of both clinical groups were either categorised as moderately (children scored above –2 SD of the mean of their age group in all subtests) or severely (children scored at or below –2 SD of the mean of their age group in at least one subtest) language delayed and compared on their performance on the SCS composite score. It was predicted that children with more sophisticated language abilities would perform better on the SCS composite score than children with poorer language abilities. The result was not found to be significant (t=.905, df=16.40, p=n.s.). Accordingly, relations between different specific language abilities and the SCS composite score were qualitatively explored (see below).

Furthermore, inspection of the boxplots showed that the individual performance of some clinical children overlapped with the performance of the control groups, although the groups of control children were found to perform significantly better than the groups of clinical children. Individual profiles of the clinical children who showed overlapping SCS with the control groups were analysed to explore their language patterns and to address the question whether any mismatchs between specific language skills and SCS could be detected in any child.

To

be able to describe and compare individual profiles, 3 different levels of language abilities (normally, moderately and severely delayed) and SCS (normal, borderline, low) were defined. Cut-off points for the categorical performance on language were determined in SD below the mean of each age group on the SETK. Similarly, cut-off points for the categorical performance on the SCS composite score were determined from the distribution of the clinical sample itself and the overlap between the clinical and the control groups as presented in table 3.16. Due to the small sample size no separate age bands were defined for the first and second half of the 3 year.

General and individual patterns of relations between performance on SCS and two specific language measures in two samples which invited further exploration are described in section 3.3.1, differences in performance on SCS between individual profiles which revealed primarily receptive respectively expressive language deficits are outlined in section 3.3.2.

Table 3.16: Cut-off points for the categorical performance on a standardised language measure, the SCS composite score and the object imitation task

Cut-off points for categories of performance on the SETK 2 and SETK 3			
	Normal language skills	**Moderate language delay**	**Severe language delay**
	at and above -1 SD	between 1 and 2 SD below the mean	at and below -2 SD
Cut-off points for categories of performance on the SCS composite in raw scores (separately for 2 age bands)			
	Normal SCS	**Borderline SCS**	**Low SCS**
	overlap of performance with the control group	at or below performance of control group but at or above average of clinical group	below the average of the clinical group
2;6-2;11	≥39	38-30.87 (30)	≤29
3;-3;11	≥48	47-41.72 (41)	≤40
Cut-off points for categories of performance on the object imitation task in raw scores (separately for 2 age bands)			
2 ;6-2 ;11	≥7	6-5.5 (5)	≤4
3 ;0-3 ;11	≥9	(mean = 9.0)	≤8

3.3.1 Relations between specific language abilities and SCS

Since the different versions of the SETK for the 2 and 3 year olds combine different subtests, data from children of the two clinical groups could not be summed to one data-set. Accordingly, sample sizes of the two separate groups (N=8 and N=11) were too small to provide a reasonable spread of scores to represent the population, hence to conduct meaningful correlations between language and SCS scores. Therefore scatterplots were used to describe distributions of performance on SCS and two specific language subtests as well as patterns of relations in two samples which invited further exploration. Relations of performance on SCS and sentence comprehension respectively morphology are described below.

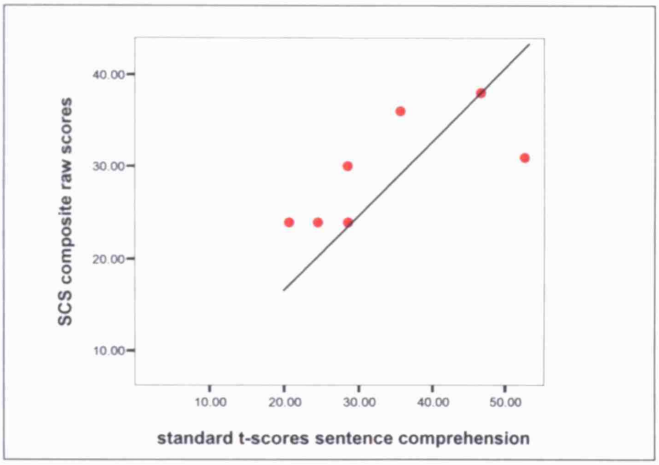
SCS and sentence comprehension

The majority of 2 year old clinical children who were poor on the SCS composite score were also poor on the sentence comprehension subtest and vice versa. This positive relationship is illustrated in the scatterplot in figure 3.9. The analysis of children's individual profiles revealed that all children with low SCS were severely delayed on the sentence comprehension task and all children with borderline SCS were either moderately delayed or typically developed on this receptive task.

Except the performance of one girl whose scores were removed from the sample. In contrast to all other children, she obtained a normal SCS composite score but was severely delayed in

the comprehension of sentences. Thus, a clear mismatch between receptive language abilities and SCS could be observed in her individual profile. In general, this premature girl obtained a nonverbal standard score of 80, performed normal on all sociocognitive measures except for the symbolic comprehension task, but low on all language subtests. Accordingly, it has to be considered whether this girl should rather had been categorised as developmental language impaired than specifically language impaired, although she had fulfilled all criteria for the clinical groups. The reverse profile of a child with a low SCS composite score and normal receptive language abilities could not be detected in this sample.

Figure 3.9: Scatterplot for SCS composite raw scores and standard t-scores for the sentence comprehension subtest (for the 2 year old clinical group)



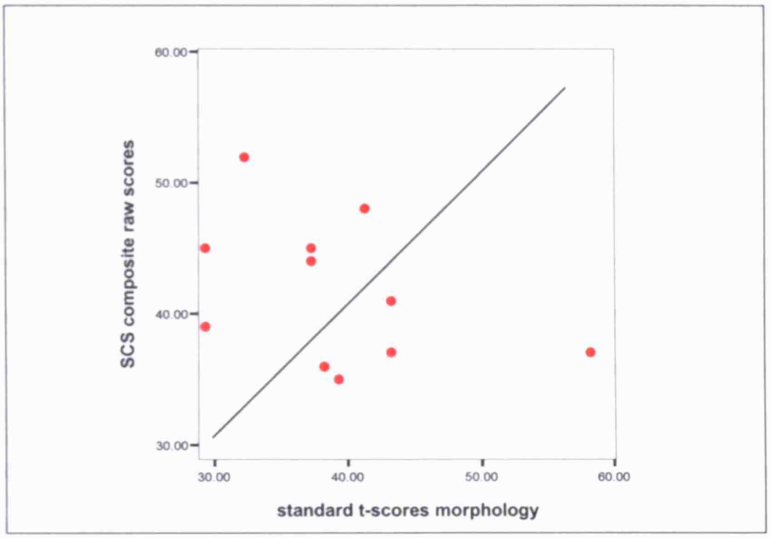
SCS and morphological skills

The majority of 3 year old clinical children who performed low on the SCS composite score performed better on the mophology subtest and vice versa. This negative relationship is illustrated in the scatterplot in figure 3.10 and could also be observed in children's individual profiles which revealed mismatchs between SCS and morphological abilities.

The 42 months old child with the highest as well as normal SCS composite score showed severely impaired morphological skills. His performance on the SCS assessments overlapped with those of the control group in all but one task. In general, he was the only child in the 3 year old clinical group who performed normal on the sentence comprehension task. In addition, his profile revealed phonological deficits.

Interestingly, the reverse pattern was found in the profiles of 2 other children in this sample. The two girls, aged 41 and 47 months, performed low on the SCS composite score but showed normal morphological skills. Their sentence comprehension skills were moderately impaired. The older girl achieved the lowest SCS composite score but the highest morphological score in this group.

Figure 3.10: Scatterplot for SCS composite raw scores and standard t-scores for the morphology subtest (for the 3 year old clinical group)



3.3.2 Primarily receptive respectively expressive language deficits and SCS

Another interesting aspect worth to examine was the question whether there existed a different relationship between SCS and receptive respectively expressive language skills. In the sample of the 2 year old clinical group 2 children showed language profiles with primarily receptive deficits and 2 other children showed language profiles with primarily expressive deficits. The rest of the group revealed no clear profiles of either receptive or expressive problems. In addition, all children in the 3 year old group, except the boy with the morphological and phonological deficits which have been described above, were found to have mixed patterns of receptive and expressive deficits. Differences in performance on SCS between the individual profiles of the 2 year olds which revealed primarily receptive respectively expressive language deficits are described below.

One girl and one boy showed typical receptive skills of word and sentence comprehension but were moderately delayed on the expressive tasks. Both children obtained a borderline SCS composite score (raw scores of 31 and 38). Interestingly, typical performance on the joint attention assessment was found. On the other hand, both children got a low score on the object imitation task, substantially below their general performance on the SCS assessments.

Two children, again a girl and a boy, were severely impaired in all receptive language tasks but only moderately impaired in the expressive tasks. In contrast to the primarily expressive delayed children these two children obtained low SCS composite scores (raw scores of 24 in both cases).

3.4 Summary

This study set out to investigate whether, and to what extent, performance on a range of SCS differ between 2 year old and 3 year old clinical and typical groups and further whether the SCS composite score related to any specific language abilities within the clinical groups.
It was found that the different SCS assessments measure related abilities, what justified the formation of a composite score in terms of construct validity.
Furthermore, results for the social responsiveness measure revealed significant differences in performance between all clinical and typical groups but this task was not found to be age sensitive, thus the 3 year old groups did not perform better than their 2 year old counterparts. Performance on the joint attention task also showed significant differences in performance between all clinical and typical groups, but here there was a significant difference between the control groups, hence this task was found to be age sensitive for the typically developing children. Regarding the symbolic comprehension task a significant main effect of group and age but no interaction between both factors became apparent, as the extent of difference between the groups of 2 and 3 year olds was similar for typical and clinical children. In both imitation tasks a clear and significant rise in scores from 2 to 3 years was found in the case of the clinical children but no significant improvement with age between the control groups. This was in line with the fact that a significant group difference between clinical and typical participants was apparent in the 2 but not for the 3 year old children. Concerning the gesture imitation task a substantial difference in the distribution of individual scores within the clinical group of 2 year olds became apparent and the refusal to imitate was associated with a severe language deficit. All comparisons of group means on the basis of the created SCS composite score turned out to be significant and therefore sensitive to age and group. Statistical analyses of differences between the groups of 2 year old typical and 3 year old clinical children either displayed an approximately equal performance of both samples or a higher performance of the younger group but in no case a higher performance of the older group.
Finally, the comparison of language skills in general and the SCS composite score was not found to be very informative about the relation between language skills and SCS. But the qualitative analyses of the relation between SCS and language skills showed that in some individual cases of language impaired 3 year olds, morphological skills were not affected despite deficits on SCS and vice versa but that sentence comprehension skills were always affected where sociocognitive deficits occurred in this sample of 2 year old clinical children. Two clinical children with primarily expressive language problems performed better on the SCS composite scores than children with primarily receptive language deficits.

4 Discussion

The different SCS addressed in this project were found to be interrelated although the nature of the relationship is complex and not entirely clear. The combination of performance on the different measure yielded a SCS composite score which interestingly and importantly revealed significant differences for all comparisons, regarding group as well as age.

Concerning the main aim of this study to explore the extent of differences between the performance of 2 year old typical and clinical groups and 3 year old typical and clinical groups on a range of SCS, results revealed highly significant differences between all groups except for the 3 year old children on the two imitation tasks. This provides evidence that young language delayed children have deficits in SCS compared to children with typical language development which are similar to those reported in children with autism. Additionally, the fact that the 3 year old language delayed children showed even worse performance than the year-younger typically developing children on the measures for social responsiveness and joint attention as well as on the SCS composite score excluded, at least for these tasks, the possibility that their lower interpersonal skills are mainly due to general developmental issues such as cognitive delay or preterm birth.

Turning to age, no improvement in performance on the social responsiveness and joint attention task was observed in the clinical groups, which could be an indicator that the problems regarding these two skills are persistent rather than delayed. Both groups, typical and clinical, showed parallel refinement of their symbolic capacities from 2 to 3 years but the most striking finding was that the clinical 3 year olds seemed to 'catch up' with their control group in terms of their imitation abilities. Although it has to be kept in mind that this investigation was not designed as a longitudinal study and hence improvements in performance may not only be due to the age difference but also to other confounding individual factors, these results are consistent with Ozenoff's and South's (2001) suggestion that imitation deficits in autism indicate a developmental delay rather than an impairment. The authors argue that children with autism develop imitative abilities, but more slowly than other infants and that this deficit affects their communicative development. This raises the question why the older language delayed children showed no imitation problems and further, what impact the imitative deficit of the 2 year olds might have had on their language and communicative development.

With reference to the first question it could be argued that the increase in imitation performance is a consequence of children's improved symbolic knowledge as it has been suggested that imitation needs symbolic understanding (Curcio, 1978). This would imply that the performance of the language delayed 2 year olds on the meaningful tasks should be more affected than the meaningless tasks. But no difference between meaningful and meaningless items was found in the gesture task. Furthermore, as a whole, results of the gesture and the actions on objects tasks revealed the same picture, although at a higher significance level in the latter case. However, inter alia through the fact that meaningless actions on objects were not assessed, it remains unclear whether the more substantial difference between typical and clinical groups on the action on objects task is due to the additional demand of symbolic capacities, to the additional involvement of objects in general or to the different applied statistical methods. Further, both imitation tasks explored the goal directed attempt to imitate and not the quality of the performance, though it became apparent that the additional consideration of the quality of the imitations would have been more informative than simply scoring the attempt to do as the person opposite to the child.

As to the second question, Nadel et al. (1999) and Nadel (2002) present a functionalistic approach in which immediate imitation serves as a preverbal imitative language which prepares preverbal communicative scripts for verbal language, that is the establishment of long-lasting and complex interactions to share intentions. Essentially, imitative language emerges around 18 months, with a peak around 30 months (Nadel, 1986, cited in Nadel, 2002) and disappears when the child has acquired enough verbal language to communicate. Consequently, a deficit in imitative behaviour during this time window could affect the development of these communicative scripts.
Furthermore, the refusal of more than one third of the 2 year old clinical children turned out to be informative about the severity of language delay and it was inferred that refusal was evidence of deficit rather than uncooperativeness. As no child completely refused to engage in the imitation of actions on objects it was further concluded that the directing character of the experimenter's instructions appeared especially difficult for these young severely language delayed children. But what makes it so difficult to engage in an imitative interactions and to attempt to imitate a modelled action? Imitating, including the imitation of language, normally requires the child to be interested in other's actions, to 'tune into' the other person, to actively engage to an interaction and most importantly to accept to be directed through another person

although it would be possible to refuse the action; thus imitating implies the willingness to do as another person in an active process.

In addition, the importance of a child's comprehension of the intention behind a person's action has been emphasised in the literature. But imitating gestures, as in one of the measures, includes neither the intention to explore an object nor the intention to refer to objects or events. Therefore the child has to understand that the main goal of this task is to do as the other person for its own sake presumably accompanied by the fun of doing so in a communicative format.
Moreover, observation shows that children within the short time frame prior and parallel to the vocabulary-spurt extensively and enthusiastically imitate the language of their counterpart, just for the sake to imitate and produce words. Concordant with Nadel's theory they stop this behaviour when they reach the expressive vocabulary-spurt.
In consideration of all these arguments it is speculated that imitation might have a function regarding children's use of words and the onset of the vocabulary-spurt. Imitation is thought to serve as a kind of means to elaborate the use and communication of words as preparation to the exclusive intentional use of language in every day conversations. Once the vocabulary-spurt is in full swing, the amount of immediate verbal imitation is reduced and no longer necessary. Cautious support for these speculations are individual profiles of the two children with normal receptive but delayed expressive language skills as their imitation performance was noticeably lower than their performance on the other SCS. Future research is needed to specify and further explore these considerations.

Finally, the comparison of language skills in general and the SCS composite score was not found to be very informative about the relation between language skills and SCS. This reflects the fact that further exploration of children's individual profiles revealed overlaps between the performance of some cases of clinical children with the performance of the control group. In addition, mismatchs between sociocognitive abilities and specific linguistic abilities were observed in the individual profiles of some language delayed children. These observations are in line with the phonological and socioconitive hypotheses, which do not expect all children with language deficits to show sociocognitive deficits (Chiat, 2001, Chiat & Roy, submitted). More specifically, in some individual cases of language impaired 3 year olds, morphological skills were not affected in the face of deficits on SCS as predicted by the phonological hypothesis, whereas sentence comprehension skills were constantly affected in the face of

sociocognitive deficits in this sample of 2 year old clinical children as predicted by the sociocognitive hypothesis.

In conclusion, the groups of young German-speaking language delayed children investigated in this study clearly revealed deficits in all SCS. These findings replicate Chiat and Roy's results with English-speaking children. However, the results regarding children's imitation skills need to be confirmed through investigations with more participants. More generally, further research is needed to explore the nature of relations between sociocognitive and language deficits, which could help to refine early intervention.

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Annex A: VEPS Assessments

VEPS ASSESSMENTS

Shula Chiat & Penny Roy

Please check with us for reference details before referencing these tests:

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City University
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e-mail:

Phone:

Social Responsiveness Assessment

This assessment measures a child's gaze at an adult's face following the adult's expression of emotions in response to a series of events. This non-verbal task extends on a procedure developed by Sigman, Kasari, Kwon & Yirmiya (1992). Sigman, M.D., Kasari, C., Kwon, J.-H. & Yirmiya, N. (1992). Responses to the negative emotions of others by autistic, mentally retarded, and normal children. *Child Development* 63, 796-80.

Materials

A bag containing 6 props: hammer and peg set with two hammers, nappy, torch with no battery in, mobile phone, small gift box with pretend spider inside, building bricks.

Procedure

The assessment takes the form of a script which incorporates 6 short scenarios leading the assessor to express 6 different emotions: hurt, surprise, anger, distraction, fear, achievement. Expressions of emotion are exaggerated, and may last up to 5 seconds if the child has not responded earlier.
Before starting, set an alarm on the mobile phone to go off after about 5 minutes.

Guidelines for script

"This morning my little brother gave me this bag of toys especially to play with [child's name]. Let's see what's inside . . .
Look, I found a hammer and peg set. Oh, look, there is another hammer for you. Let's do some hammering together".
Give the child the small hammer and hammer the pegs down together. Then pretend to hammer your finger saying:
"Ow!"
and show facial expression of HURT. [Score child's response]
"I hurt my finger. I'm going to stop hammering now"
Kiss your finger better and show the child that you are all right.
"OK, let's see what other toys we can find in the bag".
Rummage around in the bag, pull out the nappy, then show facial expression of SURPRISE. [Score child's response]
"What's this? It's a nappy. That's not a toy! Let's see what else inside our bag of toys".
Next pull out the torch.
"**Ooh, look it's a torch, it lights up. Let's switch it on".**
Try and switch the torch on, then show FRUSTRATION/ANGER by facial expression and banging the torch on your hand. [Score child's response].
"**Oh..... it's not working. It hasn't got any batteries. Let's see what else is inside our bag of toys".**
Next pull out the box.
"Ooh, a present. I wonder what's inside. Let's open it and see".
Open the box slowly, pulling the lid off so that only you and not the child can see what is inside. Then show a facial expression and body language of FEAR. [Score child's response]
"Aaaagh, it's a spider... I don't like spiders! Oh, phew, it's only a pretend spider".
At the point when the mobile phone goes off (timing may vary), show DISTRACTION as if to say 'what is that noise!' but do not speak. [Score child's response]

"Oh, it's my phone! I don't know who that is. Let's switch it off. OK, there is another toy in this bag for us to play with. Let's see what it is".
Pull out the building bricks.
"Let's see if you can build a big tower".
Give the child the bricks and when the tower is built, look impressed at child's ACHIEVEMENT as if to say 'wow' but do not speak. If the child is reluctant to build a tower, the assessor can build one and then look impressed at own achievement. [Score child's response]

Scoring

Responsiveness to the expression of emotion is scored in terms of looks to the **assessor's face** as the emotion is expressed. Points are awarded as follows:

2 - The child looks at the assessor's face for at least 2 seconds
1 - The child looks briefly or fleetingly at the assessor's face
0 - The child does not look at the assessor's face at all.

Maximum total score for social responsiveness = 12

SCORE CHART FOR SOCIAL RESPONSIVENESS ASSESSMENT				
	Look ≥ 2 seconds Score = 2	Fleeting look Score = 1	No look Score = 0	
hurt				
surprise				
anger				
fear				
distraction				
achievement				
Total				

Joint Attention Assessment

This assessment measures a child's gaze switch from object to adult (and vice versa) and monitoring of adult gaze towards an object.

Materials

Egg box of six differently coloured plastic eggs

6 miniature objects to put inside each egg: person, hat, candle, bag, tiger, ring

6 larger objects corresponding to the contents of the eggs: puppet, hat, candle, bag, tiger picture, ring. These are set around the room to the sides of and behind where the child is sitting:
e.g. tiger picture *behind and to the side of the child;* bag *to the side of you;* ring *on your finger;* puppet *where you can hang it e.g. on door handle;* hat *and* candle *on either side of child.*

Procedure

Adult takes egg box out of bag and places on table or floor - slowly.

Adult opens egg box and says **"Let's see what's inside . . . . . .Oh look! Here are some eggs".**

Adult either asks child **"Can you give me one egg"** or says **"I am going to look at this one"** and picks up one egg.

Looking at the child, the adult shakes the egg to one side with arm extended *away* from the face, *and does not say anything.* It is important that the egg is at a distance as this makes it easy to distinguish looks towards the adult and looks towards the egg. The adult waits up to 5 seconds to see if the child looks from egg to adult.

Having stimulated interest in the contents of the egg, the adult slowly opens the egg looking at the child mostly but glancing at the egg briefly as you might naturally do, and *without saying anything*, then shows the contents to the child. The adult lets the child look at or play with the toy and keeps looking at the child while the child is engaging with the toy, recording if the child looks at the adult during this time.

The adult then encourages the child to put the toy back, e.g. says **"Shall we put it back in the egg now"**, and as this is happening, says "**I brought my person / tiger today"** and looks in the direction of the object.

If the child fails to respond by follow the adult's gaze, the adult repeats the comment accompanied this time by a point in the direction of the object.

Another egg is then selected and the above procedure is repeated until all the eggs have been opened.

Scoring

Measuring gaze switch:

Either
Look from egg to adult while adult is shaking egg (i.e. before opening egg)
or
Look from toy to adult after the egg has been opened, while showing contents = 1

No look in either of the above conditions = 0

Measuring gaze monitoring:

Look following adult's gaze switch and verbal statement = 2

Look following adult's point and repeated verbal statement = 1

No look in either of the above conditions = 0

Maximum total score for joint attention = 18

Score chart

SCORE CHART FOR JOINT ATTENTION ASSESSMENT				
	Gaze switch	**Gaze monitoring**		
	While shaking egg *or* While showing contents of egg Score = 1	After adult's gaze+statement Score = 2	After adult's point+statement Score = 1	
person				
hat				
candle				
bag				
tiger				
ring				
Total				

Symbolic Comprehension Assessment

This non-verbal task draws on a procedure developed by Tomasello, Striano, and Rochat (1999) to measure children's understanding of different levels of symbolic representation.

Tomasello, M., Striano, T. and Rochat, P. (1999). Do young children use objects as symbols? *British Journal of Developmental Psychology* 17, 563-84.

Materials

1 chute for rolling objects down (this can be a long box open at each end, with one end resting on a chair or table so that objects will roll down onto floor).

4 practice objects: bag, fork, rattle, flower

For gestural condition, 6 objects: toothbrush, comb, hammer, baby's bottle, sock, scissors

For miniature condition, 6 objects + 6 miniature versions of these: teddy, brush, book, shoe, spoon, t-shirt

For substitute object condition, 6 objects: hat, telephone, crayon, plate, soap, ball
+ 6 substitutes for these: cup, banana, stick, shell, brick, apple

Procedure

Part 1: Practice condition

Items required	bag, rattle, flower, fork

The aim of the practice condition is to familiarise the child with the 'game' of choosing an object and rolling it down the chute; correct selection is not a requirement for continuation with the 3 assessment conditions.

The 4 objects are laid out on the table or floor before saying:

"Here are some things I have brought with me. Here they are on the table/floor.
I will ask you for one and you roll it down the chute. Are you ready?
Can you find the bag.
Now roll it down the chute. . . . . weeeee! Thank you / well done / fantastic!"

Repeat this procedure with the 3 remaining objects, in the following order (also shown on the Score Chart below):

Flower... Rattle... Fork

Part 2: Gestural condition

Items required	toothbrush, comb, hammer, baby's bottle, sock, scissors

The 6 items are laid out on the table or floor before saying:

"Here are some more things I have brought with me.
Now watch what I am going to do!
Can you find the....."

Finish your request by making a gesture associated with the toothbrush, pretending to brush teeth using index finger.

After this demonstration, indicate the set of 6 objects laid out on table/floor using a sweeping gesture and say:

"Which is the best one?" or ***"Which one goes best with this?".***

Then prompt the child to roll the selected object down the chute.

Repeat this procedure for the remaining 5 objects, using the following gestures, in the following order (also shown on Score Chart below):

Use hand as if holding comb and run it over surface of hair
Use hand as if holding hammer and bang with it on surface
Use hand as if holding bottle, raise to mouth and pretend to drink from it
Use hands as if pulling sock onto foot
Use first and second fingers as scissors and pretend to cut with them

After the child makes each choice, praise the child whether the choice is correct or not. Score the child's first choice.

Always return the selected item to the set so that the child always selects from a set of 6.

Part 3: Miniature condition

Items required (full-size and miniature)	toothbrush, comb, hammer, baby's bottle, sock, scissors

The full-size items are laid out on the table or floor before saying:

"Here are some more toys
Can you find the ..... (show the miniature teddy)
Now roll it down the chute...Thank you!"

Use sweeping gesture and words inviting the child to choose one object and roll it down the chute, as in the Gesture condition above.

Repeat this procedure with the remaining 5 full-size items, in the following order (also shown on Score Chart below):

brush... book... shoe... spoon... t-shirt.

After the child makes each choice, praise the child whether the choice is correct or not. Score the child's first choice.

Always return the selected item to the set so that the child always selects from a set of 6.

Part 4: Substitute object condition

Substitute objects	*cup, banana, stick, shell, wooden brick, apple*
Corresponding real objects	*hat, telephone, crayon, plate, soap, ball*

The 6 substitute items are laid out on the table or floor. The real items should not be visible at this point.

The items in this condition are presented in two sets to reduce memory load. Introduce the first set by saying:

"I have got some more things for sending down the chute, I will do some funny things with them, watch what I do! Ready?"

Then demonstrate the first 3 substitute objects, picking them up one after the other and pretending to use them as you would use their corresponding item:

Put *cup* on head as a hat
Put *banana* to ear and mime telephone conversation
Use *stick* on hand as if writing with a crayon on paper.

Then bring out the 3 corresponding real items one-by-one saying:

"Can you find the . . . (show each real item in turn but do not gesture its use, i.e. hold up hat, phone, crayon).

Also use sweeping gesture inviting the child to choose one object and roll it down the chute.

Repeat this procedure with the second set of objects, again pretending to use them as you would use their corresponding item:

Pretend to scoop up food from *shell* as if from a plate and pretend to eat
Use *brick* over hands and/or body as if to soap them
Throw *apple* in the air and catch it like a ball

Then bring out the 3 corresponding real items one-by-one saying:

"Can you find the . . . (show each real item in turn but do not gesture its use, i.e. hold up plate, soap, ball).

After the child makes each choice, praise the child whether the choice is correct or not. Score the child's first choice.

Always return the selected item to the set so that the child always selects from a set of 6.

Scoring

One mark is awarded for each object that is correctly selected in each condition.
Maximum score=18

Score Chart

SCORE CHART FOR SYMBOLIC COMPREHENSION ASSESSMENT							
Practice							
bag		rattle		flower		fork	
Assessment							
Gesture		Miniature		Substitute object			
toothbrush		teddy		hat			
comb		brush		telephone			
hammer		book		crayon			
bottle		shoe		plate			
sock		spoon		soap			
scissors		t-shirt		ball			
Total							

Annex B: Imitation Assessments

This assessment measures a child's imitation of adult's action on different levels of production. The second part is based on a procedure developed by Bekkering, Gattis and Wohlschläger (2000, 2002) to investigate goal-directed gestural imitation in children.

Bekkering, H. & Wohlschläger, A., Gattis, M. (2000). *Imitation of Gestures in Children is Goal-directed.* The Quarterly Journal of Experimental Psychology, 53A, 153-164
Gattis, M., Bekkering, H. & Wohlschläger, A. (2002). Goal-directed imitation. In A. M. Meltzoff & W. Prinz: *The Imitative Mind.* Cambridge: University Press

Materials

- For the first part: two little mice, a little chair and a little bowl with water
- For the second part no materials are necessary

Part 1 a) and b): Spontaneous and elicited imitation of actions on objects

Items required	two mice, chair, bowl with water

The therapist hides two little mice in her/his pocket. The chair and the bowl with water are behind the therapist's back.

Procedure
Part 1 a): Spontaneous imitation
The therapist produces mouse animal sounds to get child's attention ("peep, peep, peep"). She/he looks with astonishment at the child and again produces animal sounds. Then she/he takes the mouse out of her/his pocket and lets it run around in front of the child. The mouse produces further animal sounds.

The mouse introduces itself to the child with sounds, 'hello' and with its name 'mouse'. **"Hello, I am the mouse".**

After the introduction the therapist takes another mouse out of her/his pocket, making mouse noises. She/he gives the mouse to the child (or puts the mouse in front of the child) explaining: " **This is your mouse. It can play with us."**

After this the therapist's mouse introduces itself a second time to the other mouse with **'Hello, I am the mouse'.**

After this the therapist produces the following actions in a sequence. Each action/sequence should be carried out slowly , slightly exaggerated and with a short break before going on to the next action.

1. The mouse runs over the table and makes mouse sounds.
2. The mouse runs up and down the therapist's arm.
3. The therapist puts the chair and the water bowl in front of the child and then looks with astonishment at the child to direct child's attention.
   Then she/he puts the mouse slowly on the chair.
4. The therapist produces: **"And hop".**
5. After a short break the mouse jumps into the water and dives under the water.
6. The therapist takes the mouse out of the water, the mouse shakes and produces **'eeeh'** followed by **'wet'.**

Part 1 b): Spontaneous or elicited imitation
Do not administer the part 1 b) If the child spontaneously imitated every action,

The mouse runs exited over the table/floor, produces mouse sounds and says **" Again, again!".** It then invites the child's mouse to take part.
"Come on. Play with me!".

The therapist produces the actions as described in the procedure of Part 2b). But this time the mouse directly invites the child if the child does not imitate an action spontaneously with for example: **' You too' or 'You have a go' or 'Please, play with me' or 'Can you do what I do?' etc..**

Praise the child whether the imitation was correct or not.

SCORE CHART FOR IMITATION OF ACTIONS ON OBJECTS				
Practice 1: animal introduces itself first time Practice 2: animal introduces itself second time				
Action	Spontaneous Imitation sequence 1 or 2 Score = 2	Elicit Imitation sequence 2 Score = 1	No Effort to imitate Score = 0	Observations (way of production)
Animal sounds				
Run up and down the arm exploring/searching				
Put on chair				
Counting or hop				
Jump into water				
Exclamation (eeeh /wet)				
Total				

Part 2: Gesture imitation

Items required	none

Procedure

Introduce the child to the new task:
" We are going to play a game. You are my mirror. And you do (exactly) what I do".

Then demonstrate one gesture after the other. Start with the two practice gestures. Demonstrate the gesture once and wait for child's reaction. If the child shows no reaction invite the child a second time: **" Come on. Try. You can do it!"** smile and present the gesture a second time.

Before you present a new gesture start with the comment: **"O.K. I know something else."**

After the child tried, praise the child whether the imitation is correct or not.

Stop the task when the child makes no effort to try to imitate one of the first three gestures.

The Gestures:

- Practice 1: Clap your hands once
- Practice 2: Clap your hands twice
- Gesture 1: Slap both open hands on your tights
- Gesture 2: Lift both arms straight over your head
- Gesture 3: Find your nose with one hand
- Gesture 4: Put one hand on your head
- Gesture 5: Wave with one hand pretending to greet someone
- Gesture 6: Fly with your arms like a bird
- Gesture 7: Pretend to cut a slice from a loaf of bread
- Gesture 8: Raise one hand up to your mouth pretending to drink and make drinking sounds

SCORE CHART FOR IMITATION OF GESTURES					
Practice 1: clap your hands once Practice 2: clap your hands twice					
Gesture	Immediate imitation Score = 2	Imitation after second invitation Score = 1	No effort to imitate Score = 0	Observations (way of production)	
Slap hands on tights					
Lift arms over head					
Find nose with hand					
Put hand on head					
Wave					
Fly					
Cut					
Drink					
Total					

Annex C: Informationletter Head of Nursery

DEPARTMENT OF HUMAN
COMMUNICATION SCIENCE

Re: The relationship between early nonverbal skills and language development in 2-4 year old children

Dear Head of Nursery,

My name is Andrea Dohmen and I am a speech and language therapist with many years of working experience with young children. Since September 2006 I have been a student on an MSc course in Human Communication at University College London. As part of my studies I am investigating the relationship between early nonverbal processing skills and language development. This involves seeing 2- to 4- year old typically developing children during 1-2 times of testing. The results from these typically developing children will be compared anonymously with the results from children with language impairment.

I am inviting you to take part in this study. Please take time to read the following information carefully and discuss it with others if you wish. Thank you!

During the first years of life children develop nonverbal processing skills. Amongst others this includes:

- the ability to understand symbols (e.g. the drawing of an apple is a symbol for a real apple or a gesture is a symbol for a real action),
- the ability to imitate other persons (e.g. their action or language) and
- the ability to exchange attention between a person and an object of interest (e.g. to look alternately at a toy car and the mother who is saying car).

It is supposed that these nonverbal processing skills are important requirements for later language development. Therefore impairments of these abilities might be predictors of later language disorders. The purpose of this study is to find out more about the interrelations between the development of early nonverbal processing skills and language development. This knowledge would be an important foundation for developing diagnostic tools for early detection of language disorders. Furthermore it could enable us to work out intervention programmes to support these children.

The tasks to assess the early nonverbal processing skills have all been designed specifically to keep young children engaged. In the assessment of symbolic understanding for example I carry out a gesture or show the child a miniature or pretend object, and then ask the child to choose a matching object to slide down a chute. In the language assessment tasks I will ask the child to point at pictures or name pictures.

Principal Researcher: Dr Caroline Newton
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Remax House, 31/32 Alfred Place, London WC1E 7DP
Tel: +44 (0)20 7679 4222 Fax: +44 (0)20 7679 4238 www.ucl.ac.uk/HCS

To **take part** in this study, children should meet the following criteria:

- aged between 2 and 4 years (2,0 – 3,11)
- normal language development (no speech and language therapy)
- normal motor development
- no known hearing loss
- no physical or neurological illness
- no congenital illness
- monolingual German

The project should be **carried out** in a quiet room at your nursery. Parents or another carer may attend the test sessions. I expect the tasks to be fun for the children involved. However, if any child is unhappy at any point in the session, I will stop the session immediately, and he or she will not be included in the study. The tasks are carried out normally in two to three sessions of 30-45 minutes each. To ensure reliable analysis, video recordings will be made of the children. Parents will be asked to answer a questionnaire about their child's general development and their home environment.

If you are willing to take part in my study I would ask you to help me select appropriate children and provide a room for the assessments. I would be as unobtrusive as possible in the nursery setting and would work around regular activities such as circle time and meal breaks.

All information which is collected about your nursery and the children will be kept strictly confidential. The protocols and video tapes will be stored in a secure place and only my supervisors and I will have access to the **recorded data**. Any information about this study which is disseminated will have any personal identifiers removed so that you cannot be recognized from this. The collected data will be published anonymously within my dissertation and in any publications arising from this study.

You have the right to withdraw from this project at any time without giving reason.

If you would like any **further information** do not hesitate to contact me on .... I also would like to contact you by telephone within the next 1-2 weeks to talk personally to you about my study.

Thank you for taking time to read this.

Yours sincerely,

Andrea Dohmen

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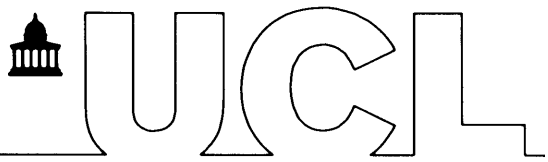
Annex D: Informationletter Head of SLT Practice

DEPARTMENT OF HUMAN
COMMUNICATION SCIENCE



Re: The relationship between early processing skills and language development in 2-4 year old children

Dear Head of SLT Practice,

My name is Andrea Dohmen and I am a speech and language therapist with many years of working experience with young children. Since September 2006 I am a student on an MSc course in Human Communication at University College London. As part of my studies I am investigating the relationship between early processing skills and language development. This involves seeing 2- to 4- year old children with atypical language development during 2-3 times of testing. The results from these children with language disorders will be compared anonymously with the results from typically developing children.

I am inviting you to take part in this study. Please take time to read the following information carefully and discuss it with others if you wish. Thank you!

During the first years of life children develop nonverbal processing skills. Amongst others this includes the ability to understand symbols, to imitate other persons or to exchange attention between a person and an object of interest. It is supposed that these processing skills are important requirements for later language development and that therefore impairments of these abilities might be predictors of later language disorders. The **purpose** of my study is to find out more about the interrelations between the development of early processing skills and language development. This knowledge would be an important foundation for developing diagnostic tools for early detection of language disorders. Furthermore it could enable us to work out intervention programmes to support these children.

All **assessments** are carried out in consultation with you and will be imbedded into the regular diagnostic process within the scope of your aimed intervention. The tasks to assess the early nonverbal processing skills all have been designed specifically to keep young children engaged. The language assessments includes routine tasks conducted with children in practices for speech and language therapy.

Principal Researcher: Dr Caroline Newton
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To **take part** in this study, children should meet the following criteria:

- aged between 2 and 4 years
- atypical language development
- normal motor development
- no known hearing loss
- no physical or neurological illness
- no congenital illness
- monolingual German

The project should be **carried out** in a quiet room at your practice. You, parents or another carer may attend the test sessions. I expect the tasks to be fun for the children involved. However, if any child is unhappy at any point in the session, I will stop the session immediately, and he or she will not be included in the study. The tasks are carried out normally in two to three sessions of 30-45 minutes each. To ensure reliable analysis, video recordings will be made of the children. Parents will be asked to answer a questionnaire about their child's general development and their home environment.

If you are willing to take part in my study I would ask you to help me select appropriate children and provide a room for the assessments. I would be as unobtrusive as possible in the practice setting.

All information which is collected about your practice and the children will be kept strictly confidential. The protocols and video tapes will be stored in a secure place and only my supervisors and I will have access to the **recorded data**. Any information about this study which is disseminated will have any personal identifiers removed so that you cannot be recognized from this. The collected data will be published anonymously within my dissertation and in any publications arising from this study.

You have the right to withdraw from this project at any time without giving reason.

If you would like any **further information** do not hesitate to contact me on .... I also would like to contact you by telephone within the next 1-2 weeks to talk personally to you about my study.

Thank you for taking time to read this.

Yours sincerely,

Andrea Dohmen

Principal Researcher: Dr Caroline Newton
Department of Human Communication Science University College London
Remax House, 31/32 Alfred Place, London WC1E 7DP
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Annex E: Nursery Consent Form

DEPARTMENT OF HUMAN COMMUNICATION SCIENCE

NURSERY CONSENT FORM

Title of Project: **The relationship between early nonverbal skills and language development in 2-4 year old children**

Name of Researcher: Andrea Dohmen (Supervisors: Prof Shula Chiat and Dr Caroline Newton)

We, _____,
name of the nursery

- have read and understood the information letter about Ms Andrea Dohmen's research project and had the opportunity to ask questions.
- agree to participate in the research project and to provide information about the nursery environment. We will distribute information about the project to parents, subject to the project receiving ethical approval.
- agree that Ms Dohmen is allowed to document the interview and use the outcomes anonymously for the purpose of data analysis. Additionally she is permitted to publish her results anonymously.
- know that participation is voluntary and that we have the right to withdraw consent without giving reason at any time.

_____ _____

Date Printed name (head of the nursery)

_____

Signature (head of the nursery and stamp of the institution)

Investigator's statement

I .....

Confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonable foreseeable risks or benefits.

Signed:..... Date:.....

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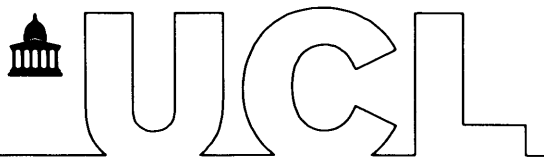
Annex F: SLT Practice Consent Form

DEPARTMENT OF HUMAN
COMMUNICATION SCIENCE



SPEECH AND LANGUAGE THERAPY PRACTICE CONSENT FORM

Title of Project: The relationship between early processing skills and language development in 2-4 year old children

Name of Researcher: Andrea Dohmen (Supervisors: Prof Shula Chiat and Dr Caroline Newton)

We, _____,
name of the speech and language therapy practice

have read and understood the information letter about Ms Andrea Dohmen's research project and had the opportunity to ask questions.

agree to participate in the research project and to provide information about the practice environment. We will distribute information about the project to parents, subject to the project receiving ethical approval.

agree that Ms Dohmen is allowed to document the interview and use the outcomes anonymously for the purpose of data analysis. Additionally she is permitted to publish her results anonymously.

know that participation is voluntary and that we have the right to withdraw consent without giving reason at any time.

_____ _____
Date Printed name (head of the practice)

_____
Signature (head of the practice
and stamp of the institution)

Investigator's statement

I .....

Confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonable foreseeable risks or benefits.

Signed:..... Date:.....

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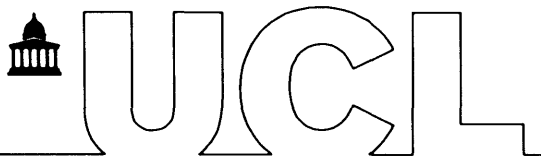
Annex G: Information Parents Nursery

DEPARTMENT OF HUMAN
COMMUNICATION SCIENCE



INFORMATION FOR PARENTS

The relationship between early nonverbal skills and language development
in 2-4 year old children

This study has been approved by the UCL Research Ethics Committee with the Project ID Number: 0880/001.

Personal information
My name is Andrea Dohmen and I am a speech and language therapist with many years of working experience with young children. Since September 2006 I have been a student on a MSc course in Human Communication at University College London (United Kingdom). As part of my studies I am investigating the relationship between early nonverbal skills and language development. This involves seeing 2- to 4- year old typically developing children during 1-2 times of testing.

I am inviting you and your child to take part in this study. Please take time to read the following information carefully and discuss it with others if you wish. Thank you!

What is the purpose of this study?
During the first years of life children develop nonverbal skills. Amongst others this includes:

- the ability to understand symbols (e.g. the drawing of an apple is a symbol for a real apple or a gesture is a symbol for a real action),
- the ability to imitate other persons (e.g. their action or language) and
- the ability to exchange attention between a person and an object of interest (e.g. to look alternately at a toy car and the mother who is saying car).

It is supposed that these nonverbal skills are important requirements for later language development. Therefore impairments of these abilities might be predictors of later language disorders. The purpose of this study is to find out more about the relationship between the development of early nonverbal skills and language development. This knowledge would be an important foundation for developing diagnostic tools for early detection of language disorders. Furthermore it could enable us to work out intervention programmes to support these children.

The tasks to assess the early nonverbal processing skills all take the form of games. In the assessment of joint attention for example, I show your child a set of plastic eggs, open them one at a time to reveal a surprise object, and then indicate another object in the room. In the assessment of symbolic understanding I carry out a gesture or show your child a miniature or pretend object, and then ask the child to choose a matching object to slide down a chute. In the language assessment tasks I will ask your child to point at pictures or name pictures.

Who can take part in the study?
To take part in this study, children should meet the following criteria:

- aged between 2 and 4 years (just until the 4th birthday)
- normal language development (no speech and language therapy)
- monolingual German
- normal motor development

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- no known hearing loss, physical or neurological illness

Where will the study take place?
The nursery, which your child attends, has kindly agreed to support my study by offering the possibility to test children there, whose parents agree to their participation and who are themselves willing to participate.

What does participation in the study mean for your child?
The project is carried out in a quiet room of the nursery. You or another carer may attend the test sessions. I will only include children who are happy to join in the session. I expect the tasks to be fun for the children involved. I expect the tasks to be fun for the children involved. However, if any child is unhappy at any point in the session, I will stop the session immediately, and he or she will not be included in the study. The tasks are carried out in two to three sessions of 30-45 minutes each. To ensure reliable analysis, the session will be videotaped with your permission.

What does participation in the study mean for you?
If you decide to take part you should keep this information sheet but sign and return the attached consent letter to the nursery. You will then receive a short questionnaire about your child's development and about his/her early literacy, speech and language development. I will then arrange to see your child in his/her nursery. If you wish me to, I will let you know if your child has a particular difficulty with the tasks presented.

What will happen to the collected data?
All information which is collected about you and your child will be kept strictly confidential. The video tapes will be stored in a secure place and only my supervisors and I will have access to the recorded data. Any information about this study which is disseminated will have any personal identifiers removed so that you cannot be recognized from this. The collected data will be published anonymously within my dissertation and in any publications arising from this study.

If you wish to take part:
I would like to ask you to complete and sign the consent letter and return it to the staff at the nursery.

You have the right to withdraw from this project at any time without giving reason.

If you have any questions regarding my study or if you would like more information about it, please do not hesitate to contact me on ... or you can contact me personally during my time in the nursery.

The project does not involve any physically invasive or risky procedures. However, if you have any complaints or concerns about the procedure, please contact me or my supervisors at University College London (contact details below).

Thank you for taking time to read this!

Yours sincerely,

Andrea Dohmen

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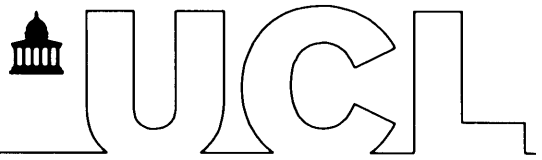
Annex H: Information Parents SLT Practice

DEPARTMENT OF HUMAN
COMMUNICATION SCIENCE



INFORMATION FOR PARENTS

The relationship between early nonverbal skills and language development in 2-4 year old children

This study has been approved by the UCL Research Ethics Committee with the Project ID Number: 0880/001.

Personal information
My name is Andrea Dohmen and I am a speech and language therapist with many years of working experience with young children. Since September 2006 I have been a student on an MSc course in Human Communication at University College London (United Kingdom). As part of my studies I am investigating the relationship between early nonverbal skills for language development. This involves seeing 2- to 4- year old children with language problems during 2-3 times of testing.

I am inviting you and your child to take part in this study. Please take time to read the following information carefully and discuss it with others if you wish. Thank you!

What is the purpose of this study?
During the first years of life children develop nonverbal skills. Amongst others this includes:

- the ability to understand symbols (e.g. the drawing of an apple is a symbol for a real apple or a gesture is a symbol for a real action),
- the ability to imitate other persons (e.g. their action or language) and
- the ability to exchange attention between a person and an object of interest (e.g. to look alternately at a toy car and the mother who is saying car).

It is supposed that these nonverbal skills are important requirements for later language development. Therefore impairments of these abilities might be predictors of later language disorders. The purpose of this study is to find out more about the relationship between the development of early nonverbal skills and language development. This knowledge would be an important foundation for developing diagnostic tools for early detection of language disorders. Furthermore it could enable us to work out intervention programmes to support these children.

All assessments will be imbedded into the regular diagnostic process within the scope of your child's therapy and they are carried out in consultation with your speech and language therapist. The tasks to assess the early nonverbal processing skills all take the form of games. In the assessment of joint attention for example, I show your child a set of plastic eggs, open them one at a time to reveal a surprise object, and then indicate another object in the room. In the assessment of symbolic understanding I carry out a gesture or show your child a miniature or pretend object, and then ask the child to choose a matching object to slide down a chute. In the language assessment tasks I will be asking the child to point at pictures or name pictures.

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Who can take part in the study?
To take part in this study, children should meet the following criteria:

- aged between 2 and 4 years (just until the 4th birthday)
- language problems
- monolingual German
- normal motor development
- no known hearing loss
- no physical or neurological illness

Where will the study take place?
The practice, which your child attends, has kindly agreed to support my study by offering the possibility to test children there, provided whose agree to their participation and who are themselves willing to participate.

What does participation in the study mean for your child?
The project is carried out in a quiet room of the practice. You or your speech and language therapist may attend the test sessions. I will only include children who are happy to join in the session. I expect the tasks to be fun for the children involved. However, if any child is unhappy at any point in the session, I will stop the session immediately, and he or she will not be included in the study. The tasks are carried out in two to three sessions of 30-45 minutes each. To ensure reliable analysis, the session will be videotaped with your permission.

What does participation in the study mean for you?
If you decide to take part you should keep this information sheet and sign and return the attached consent form to your speech and language therapist. You will then receive a short questionnaire about your child's development and about his/her early literacy, speech and language development. I will then arrange to see your child in his/her practice. If you wish me to, I will let you know if your child has a particular difficulty with the tasks presented.

What will happen to the collected data?
All information which is collected about you and your child will be kept strictly confidential. The video tapes will be stored in a secure place and only my supervisors and I will have access to the recorded data. Any information about this study which is disseminated will have any personal identifiers removed so that you cannot be recognized from this. The collected data will be published anonymously within my dissertation and in any publications arising from this study.

If you wish to take part:
I would like to ask you to complete and sign the consent letter and return it to your speech and language therapist.

You have the right to withdraw from this project at any time without giving reason.

If you have any questions regarding my study or if you would like more information about it, please do not hesitate to contact me on ... or you can contact me personally during my time in the practice.
The project does not involve any physically invasive or risky procedures. However, if you have any complaints or concerns about the procedure, please contact me or my supervisor at University College London (contact details below).
Thank you for taking time to read this!

Yours sincerely,

Andrea Dohmen

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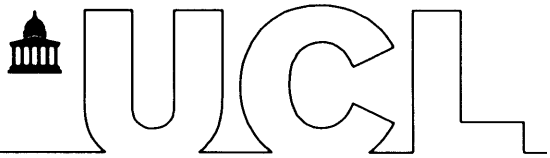
Annex I: Informed Consent Form Parents

DEPARTMENT OF HUMAN
COMMUNICATION SCIENCE



Informed Consent Form

(This form to be completed independently by the parent after reading the Information Sheet and/or having listened to an explanation about the research.)

Title of Project: **The relationship between early nonverbal skills and language development in 2-4 year old children**

Investigators: Andrea Dohmen, Prof Shula Chiat, Dr Caroline Newton

This study has been approved by the UCL Research Ethics Committee with the Project ID Number: 0880/001.

	YES	NO
Have you read the Parent Information Sheet?		
Have you had the opportunity to ask questions and discuss the study?		
Have you received satisfactory answers to all your questions?		
Have you received enough information about the study?		
Do you agree to your child participating in this study?		
Do you give permission to video record the session with your child and keep the recording until the end of the study (September 2007)?		
Do you understand that you are free to withdraw your child from the study without penalty at any stage?		
Do you agree with the publication of the anonymous results of this study in an appropriate outlet/s?		

Comment or Concerns During the Study
If you have any comments or concerns you should discuss these with the Principal Researcher. If you wish to go further and complain about any aspect of the way you have been approached or treated during the course of the study, you should email the Chair of the UCL Committee for the Ethics of Non-NHS Human Research (gradschoolhead@ucl.ac.uk) or send a letter to: The Graduate School, North Cloisters, Wilkins Building, UCL, Gower Street, London WC1E 6BT who will take the complaint forward as necessary.

Child's Name..... **Date of Birth**.....

	YES	NO
My child grows up monolingual German.		
My child has had speech and/or language difficulties.		
My child has a known hearing loss.		
My child has developed typically (e.g. no diagnosed syndromes or specific illnesses).		
If my child has a particular difficulty with the tasks presented, I would like to be informed about it.		
This information can be forwarded to the nursery staff.		

Signed:..... **Date:**.....

Full Name in Capitals: .....

Investigator's statement

I .....

Confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonable foreseeable risks or benefits.

Signed:..... **Date:**.....

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