School of Education

Patterns of Understanding of Prepositions among Children Showing Typical Language Development and Children with Specific Language Impairment

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

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Abstract

The study examines how semantic features are configured by children diagnosed with Specific Language Impairment (SLI) and by children showing Typical Language Development (TLD) in their understanding of prepositions. The purpose was to describe specific features that children use when they configured objects in response to a preposition word. The target list of prepositions in the main study were; 'in', 'on', 'under',' over', 'behind', 'next to', 'between', 'through', 'around' and 'across'. These words are commonly used everyday words and comprehension of the spatial meaning they convey can greatly assist in deciphering interactions with others, following instructions, and developing an overall understanding of the physical world.

Semantic Feature Analysis (SFA) or componential analysis was used to analyse the findings. The findings reveal the pattern of similarities and differences in semantic features configured by 106 children age 4 to 6 years showing TLD and 25 children with SLI age 5 to 6 years related to their understanding of preposition words. Adult understandings in responses to images associated with configuring objects are also described and compared to those of children. The pedagogical implications of these findings are discussed. Ultimately, the information derived from this study aimed to enhance the learning outcomes for children with SLI.

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To the children who participated in this study, I thank you. I would especially like to thank those parents who gave permission for their children to participate in a study where there was no personal gain. This demonstrates a tremendous unselfishness and willingness to assist others. To the children with Specific Language Impairment (SLI) who participated, I will be forever in your debt. This study has not only assisted each of you but in the future will have a direct impact on the teaching and learning for children in similar circumstances. I would also like to thank the educators who accommodated me while I spent time with them and the children in their care. This was a huge imposition and interruption to the daily teaching program for a significant period of time. Everyone saw the importance of the sacrifice.

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My supervisor, Dr Chris Conlan, for his inspiration and guidance. You encouraged me to ask questions, seek answers and develop a deep understanding of what was discovered. You taught me to step back and take time for understanding to develop.

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Glossary of Terms

Expressive language: The words that are produced and collectively combined into speech in order to convey a message (Bender, 2004; Crystal & Varley, 1993).

Inclusion The basic philosophy of inclusion is that principles of anti-discrimination, equity, social justice and basic human rights make it essential that students with disabilities and special needs should enjoy the same access as all other students to a regular school environment and to a broad, balanced and relevant curriculum (Foreman, 2005).

Integration: A term used to describe the attendance of a child at a regular school. A child who attends a mainstream school but is in a separate special unit or class is still said to be integrated. (Integration is also the term used for transition from a more segregated unit to regular school (Westwood, 2001) but will not be used for the purposes of this study).

Language Acquisition: A degree of unconscious language acquisition or innateness in humans to acquire language**.** The ability to internalise rules regarding their native language grammar and syntax and remember irregular forms (Krashen, 2003).

Language Learning: Formal instruction and the conscious scrutinising of language use (Krashen, 2003).

LDC: <u>L</u>anguage <u>D</u>evelopment <u>C</u>entre. A group of classrooms in a segregated education centre situated in the grounds of a regular Western Australian government school teaching children from K-Y3 with identified speech and language disorders.

Mainstream/regular classroom setting: A classroom setting in a school environment where the students are from a variety of academic and social backgrounds.

Preposition Prototypes: The central essence or features of a word that can include geometric, functional and pragmatic components (Herskovits,1985).

Prototypicality: Prototypicality effects and selection components assume that less typical examples have different features (Aarts & McMahon, 2006; Curzan & Adams, 2009).

Receptive language: The understanding and decoding of the meaning of language. This includes skills from basic listening and understanding single words to following a long conversation or understanding the subtle messages implied in an utterance (Bender, 2004; Crystal & Varley, 1993).

Semantic Feature Analysis (SFA) or Componential Analysis: A linguistic model that involves characterising the semantic differences between different semantic features (Durbin, 1972).

SLI: Specific Language Impairment. "Communication, speech, expressive and/or receptive abilities are significantly impaired. The severity cannot be accounted for by hearing impairment, cognitive development, social, emotional or cultural factors" (Department of Education of Western Australia, 2004).

TLD: Typical Language Development: Observed in children who demonstrate typical patterns of language acquisition and who have not been identified with a language impairment.

Preface

This research is part of a journey of discovery. As a parent I want to ensure my children are given the best chance in life. My son was diagnosed with Specific Language Impairment (SLI) at the age of four. At the time this seemed to provide some answers to the difficulties he had with comprehending language and the repetitive behaviours that were obviously a way of structuring his world. I was told not to look any further as a diagnosis had been made.

My son learnt strategies to organise his understandings and I learnt along with him. This time was fraught with countless tears. As he grew and life became more demanding I knew I needed to seek ways to help him. Completing my teaching degree and my honours research was the beginning of that journey. It seemed a natural progression to then go on and assist others with the knowledge I had.

As a qualified teacher working with children who had been diagnosed with SLI I spent my days constantly trying to find new and innovative ways to assist them to learn language in the same way as I understood it. Sometimes things worked and sometimes they didn't. I wanted to find out how the children themselves understood language and I began looking for answers. But what happens when the answers you seek don't exist? For me it meant having to go and find them. The research described in this thesis is just the beginning of that search.

CHAPTER 1

Introduction and Overview

This study grew out of the recognition of the need to increase the language ability of children with Specific Language Impairment (SLI). Children with SLI are a population who exhibit language learning difficulties in absence of other factors (Batshaw, 2002; Bender, 2004; Marinis, 2011; Trauner, Wulfeck, Talla & Hesselink, 2000). Language abilities in children with SLI are below age expectations when other non-language developmental milestones are within or above age expectations. Approximately 7 % of 5 to 6 year old children meet the criteria for SLI (Tomblin, et al., 1997). If children with non-verbal intelligence quota (IQ) levels in the range of 70 to 85 are included, the estimated prevalence of SLI is 10% of 5 to 6 year old children (Tomblin et al., 1997).

 Children with SLI do not constitute a homogeneous group. Some children with SLI appear to have difficulties acquiring and using language that is seen as a delay in language development. These children have been observed to be following a similar pattern of language development as children showing TLD. The language related milestones seen in children showing TLD are achieved by these children with SLI but at a significantly slower rate (Trauner, Wulfeck, Tallal, & Hesselink, 2000). Children with SLI are also described as presenting with a disordered or atypical pattern of language development (Bates & Goodman, 2001; Leonard, 1998).

Tomblin, Records, Buckwater, Zhang, Smith, and O'Brien (2003) identified two groups of children who experience difficulties acquiring language; those with primary language learning difficulties and those with secondary language learning difficulties. It is argued that children with SLI demonstrate primary language learning difficulties due to the absence of factors considered to directly impact on language acquisition and learning such as neurological damage, hearing impairment, low non-verbal intelligence quota (IQ) or oral structure or significant motor abnormalities (Batshaw, 2002; Bender, 2004; Bishop, 2004; Marinis, 2011; Trauner et al., 2000). Autism, developmental delay and brain damage can be associated with language learning difficulties but these difficulties are described as secondary because they result from the main diagnosis (Shuele & Hadley, 1999).

There have been attempts to provide empirical evidence and clinical diagnosis for classifying different types of SLI (Beitchman et al. 1989; Bishop, 2004; Conti-Ramsden, Crutchley & Botting, 1997; Van Weerdenburg, Verhoeven & Van Balkom, 2006). Regardless of how the inconsistencies in language acquisition are disseminated, children with SLI find it more difficult than their peers who show Typical Language Development (TLD) to acquire and use many different aspects of language (Bishop, 1992, 1997; Carrow-Woolfolk, 1988; Clahsen, 1989, 1991; Leonard, 1998; Norbury, Bishop, & Briscoe, 2001, 2002). Children with SLI are also observed as experiencing difficulties with acquiring and using the closed class set of words that are prepositions.

Prepositions are connective words that serve a number of semantic and syntactic functions. A preposition can be defined as a word or group of words that link noun phrases to the rest of the sentence and show the relationship between things in time and space (Crystal, 1991). The underlying purpose of this study was to determine an understanding of how semantic features of prepositions specifically 'in', 'on', 'under', 'over', 'behind', 'in front' 'between', 'next to', 'through', 'around' and 'across' may be configured by young children. The inability to understand and use prepositions can greatly hinder following and giving simple instructions and locating objects or places. The literature that explores the understanding of children with TLD in relation to prepositions such as 'in and 'on' is widespread (Bowerman & Choi, 2001). There is some literature related to the preposition 'under' (Rofhling, 2006) and some studies related to proximity prepositions 'in front', 'behind' and 'next to' (Durkin, 1981; Telleen & Wren, 1985) but literature related to other prepositions is sparse. Other studies have examined the verbal proficiency of preposition use in SLI (Watkins & Rice, 1991) and compared this with preposition use in children with TLD (Grela, Rashiti & Soares, 2004). There is a scarcity of investigations providing a comprehensive overview of semantic features related to prepositions. This study examined the understanding of semantic features related to a range of prepositions in children with SLI and compared these understandings with those features understood by children showing TLD and adults. It is not suggested that one perspective or understanding of the features related to a preposition word identified in demonstrations of any group of participants was superior in any way to that of another. It is merely to

know what those understandings and perspectives are. Nevertheless, in order to purposefully converse fully with others within a culture there needs to be the same or similar meaning assigned to words. This is especially true of words such as prepositions that serve to illustrate relationships among other words in a sentence.

1.1 Theoretical Framework

There are different theoretical perspectives on language acquisition and development (Otto, 2010). Chomsky (1965), states that children have an inherited ability to learn language and that every child has a 'language acquisition device' or LAD which encodes the grammatical structures and principles of a language. Chomsky (1972) also proposed that the principles of grammar are innate but the specific parameters are set by the language a child learns. While Saussure (1916) viewed language more as the property of a community into which the speaker was admitted as the language was acquired, Chomsky viewed language as being the inherent property of the individual which is triggered by exposure to language. Halliday (1975) argues a functional approach to language development stating that language learning stems from a need of children to function in society. The interactionist perspective of language acquisition focuses on the importance of social-cultural interactions. Vygotsky (1962) recognised that language learning was a result of both biological and environmental factors. Vygotsky did not see language acquisition as a private activity but highlighted the importance of adult and peer interaction. Vygotsky's theory mirrors the cognitive and social influences on language acquisition suggested by Chomsky. Conversely Piaget (1954) gave much less attention to the role of social interaction and focused on the role of the child's construction of the physical world. All theories of language acquisition advocate some degree of innateness in humans to acquire language (Carrow-Woolfolk, 1988; Chomsky, 1965).

1.2 Context and Background

In nearly all cases, children's language development follows a predictable sequence. In the earliest stages of language development children begin producing verbal sounds from about six to eight months by babbling. The holophrastic stage or

one-word stage (one morpheme or one meaning unit) where spoken words are generally monosyllabic can occur around the age of nine to eighteen months when children begin to utter recognisable words. English language development starts with the production of one word utterances, usually nouns, and progresses to two or more word utterances with the use of verbs, pronouns and prepositions emerging later (Brown, 1973; Halliday, 1975; Lund & Duchan, 1993; Windfurr, Farager & Conti-Ramsden, 2002). During this time there are under-extensions and over-extensions of word use that develop and change over time in an individual child's usage (Owens, 2008). At around two years of age simple semantic relations are demonstrated by children during the two-word stage by producing a noun form together with another word in their speech. The telegraphic stage occurs at approximately 24 to 30 months and consists of children producing sentences of lexical morphemes with later incorporation of functional or grammatical morphemes. Finally, the multi-word stage observed in children with TLD by 3 to 3.5 years, is where basic morphological and syntactic structures emerge in children's speech but initially children do not produce adult-like utterances (Bates & Goodman, 2001; Kagan & Herschkowitz, 2005; Owens, 2008). Brown's longitudinal study (1973) concluded that children go through the same stages but these stages are not linked to syntactic complexity. This is discussed in detail in Chapter 2, § 2.1.1. Not all children acquire language following this predictable progression but comprehension of words combined with years of active participation and production of language results in linguistic competence in most children (Harris, 2009).

Language can be divided into two major categories, receptive and expressive. In addition to problems with form and content, students with language disabilities may exhibit difficulties with pragmatics (Hallahan, Lloyd, Kauffman, Weiss & Martinez, 2005). Difficulty in understanding relationships between form and content may foster more concrete thinking patterns, which further lead to problems interpreting figurative language and words with multiple meanings. Deficits in this area may be characterised by an inability to initiate, sustain, or monitor conversational dialogue, in addition to an inability to interpret nonverbal cues from the listener in the conversation (Deutch Smith, 2004; Hallahan et al., 2005).

While this thesis is not primarily about linguistics, terms from that field, given the topic of the thesis inevitably appear in the text. Therefore it is important to outline the various components of language. The most common of them, and the way they are used within the text are discussed in what follows.

1.2.1 Syntax

Language systems have a scheme of conventions of how words should be syntactically combined to create meaningful expressions (Otto, 2010). Knowledge of syntax or the rules that govern the phrases, clause and sentence in any language occurs at an unconscious level and is vital in order to converse and to comprehend others (Kagan & Herschkowitz, 2005). Young children demonstrating TLD are able to deduce part of a new word's meaning from the syntax of the sentences in which the new word appears, which is known as 'bootstrapping'. Syntactic bootstrapping is understood to be a method of acquiring new vocabulary where syntactic cues are used as an aid in creating lexical mapping (Rice, Cleave, & Oetting, 2000).

1.2.2 Morphemes

Morphemes are the smallest meaningful syntactic units. A definition of a morpheme offered by Harris (1942) "Every sequence of phonemes which has meaning, and which is not composed of smaller sequences having meaning is a morpheme" (p 109). Morphemes can also be described as bound or free. Bound morphemes cannot function independently and must always attach to a free morpheme to carry meaning. Free morphemes carry individual meaning and operate independently. Both open and closed classes can contain bound and free morphemes (Curzan & Adams, 2009; Winch & Blaxell, 2006). Therefore morphemes do not need to be whole words and can be either a base word or an affix. An affix is an element of a word joined to a base morpheme. This can be either a prefix (preceding the word) or an infix (an affix which is incorporated inside another word) or a suffix (following the word) (Curzan & Adams, 2009).

Lexical morphemes are words that have meaning beyond whatever grammatical information they also transmit. They can be nouns (e.g. child, dog), verbs (e.g. evaporate, touch) and adjectives (e.g. good, bad) to which additional morphemes can be

added. Free lexical morphemes readily accept new additions to the class. Examples of closed-class morphemes are prepositions (e.g. in, on), conjunctions (e.g. but, for) and determiners (e.g. the, my). Words in this class exist within a specified syntactic category where the relationships between words in sentences and phrases and are considered limited in number (Bender, 2004). New words are seldom added to this word class (Curzan & Adams, 2009; Winch & Blaxell, 2006).

1.2.3 Semantics

One application of semantics deals with the meaning of individual words or relationships between the words in phrases (Kearns, 2000). Language interpretation involves an awareness and ability to make linguistically guided deductions of semantic content in utterances. Semantic knowledge is seen to be the understanding of words that relate to concepts and semantic networks or schemata which are the thought process that organise the conceptual knowledge (Otto, 2010). In acquiring concepts children learn that objects or actions of a similar nature can be bound together collectively in categories (Otto, 2010). Increasing semantic representations enable semantic networks to form (Kagan & Herschkowitz, 2005).

1.2.4 Prepositions

Prepositions are a class of words that cannot be inflected. They are words that have only one possible form regardless of the case, gender etc. of the word they are referring to. A preposition can either precede or follow a noun or come before a pronoun (Winch & Blaxell, 2006). Prepositions introduce the object of a prepositional phrase and can precede its complement; a noun, adjective or verb to form a prepositional phrase. Semantic classification for prepositions includes temporal prepositions such as 'before', 'after', 'while', spatial prepositions such as 'behind', 'under' and 'in', prepositions expressing cause such as 'because' and prepositions expressing purpose such as 'for'. Complex prepositions are a group of words that function as a single preposition such as 'next to', 'on top of' and 'in front of' (Winch & Blaxell, 2006).

1.3 Integration and Inclusion

Education providers, including preschools, kindergartens, schools in the public sector, and schools registered through school registration authorities in the private sector are accountable and legally obliged to make changes to accommodate for the needs of a student with a disability such as SLI.

1.3.2 Inclusion

The basic philosophy of inclusion is that in the interests of equity principles of anti-discrimination, equity, social justice and basic human rights mean students with disabilities and special needs should enjoy the same access as all other students to a regular school environment and to a broad, balanced and relevant curriculum (Foreman, 2005; United Nations Educational, Scientific and Cultural Organisation, UNESCO, 1994).

1.3.3 Legislation and Policy Related to Inclusion

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) states that inclusive environments in regular schools are the most effective means of education (UNESCO, 1994). *The Disability Services Act 1993 of Western Australia* encourages people who provide services to the general public to adapt those services to meet the needs of people with disabilities (Disability Services Commission, 1993). Work on the development of *Disability Standards for Education 2005,* a legislative instrument, was registered as a Standard in March 2005 (Australian Government, 2005). All education providers are bound by the Standards. The primary purpose of the *Standards* is to clarify and make more explicit the requirements of education and training service providers under the *Disability Services Act 1993* and the rights of people with disabilities in relation to education and training. In spite of this there is no current legislation or policy mandating exactly how education services should be provided. The current criteria in Western Australia for eligibility and access to specialist programs for communication, speech or language impairments are, "Communication, speech, expressive and/or receptive abilities are significantly impaired. The severity cannot be

accounted for by hearing impairment, cognitive development, social, emotional or cultural factors" (Department of Education of Western Australia, 2004, pp. 101).

1.3.4 Educator Efficacy

The achievability and efficacy of integration and inclusion is significantly influenced by educators' own beliefs and attitudes (Westwood, 2001). An investigation undertaken by Paterson and Graham (2000) gave some insights to the practice of educators in mainstream classes. It can be gleaned from the study that educators' actions were guided by their thoughts which, in turn, were influenced by and influence their actions. While the educators studied saw the children with SLI as a heterogeneous group with differing needs and they supported the right of students to be educated in regular educational settings, they lacked confidence in their own ability to meet the needs of all children in mainstream teaching contexts (Paterson & Graham, 2000).

Educators are at the forefront of teaching students with disabilities such as SLI and their perceived level of self efficacy is one of the challenges that detract from successful inclusion. Educator attitude is an essential factor to successful inclusion and there is seen to be a direct relationship between the level of severity in a student's disability and the attitude of teachers (Yuen & Westwood, 2001). Attitudes and confidence of educators vary significantly according to the type and severity of a student's disability with emotionally and behaviourally disordered students commonly regarded as the most problematic and a potential source of teacher stress (Westwood, 2001). Language and communication difficulties are seen to affect social and interpersonal interactions with a significant number of children displaying frustration manifesting itself in behavioural difficulties (Hallahan et al., 2005; Hartas, 2005). Dockrell and Lindsay (2001) showed that teachers were rarely aware of the relationships between language impairment, behaviour and literacy learning difficulties. Children's difficulties were often attributed to superficial problems such as 'laziness'. Attitudes appeared to be more positive towards children whose needs are specific, defined as a purely physical or those needs that were perceived as less complicated in nature. There are numerous reports and studies that report that even when educator attitudes are positive there is still a lack of

confidence in skills that can inhibit inclusion (Kavale, 2002; Mohay & Reid, 2006; Paterson & Graham, 2000; Westwood, 2001; Yuen & Westwood, 2005).

1.3.5 Differentiation of the Curriculum

For children with educational needs linked to their difficulties acquiring language, differentiation of the curriculum is seen as a contributory factor to successful inclusion in the mainstream educational setting (Scott & Spencer, 2006; Westwood, 2001). Educators described as holding positive beliefs about adaptive or differentiated teaching and inclusive teaching practices were in general agreement that differentiated and inclusive teaching practices have positive outcomes for students (Scott & Spencer, 2006). Children with disabilities demonstrate improved social competence and communication skills when integrated into inclusive settings (Foreman, 2005). To facilitate the inclusion of children with language difficulties specific strategies related to the enhancement of semantic, syntactic and pragmatic language competencies are required (Deutch Smith, 2004). For intervention to be successful, it must be functional and meaningful to the student with language and learning disabilities. Language learning environments that have been identified as effective require the educator to ensure opportunities for frequent verbal interactions in the classroom where children use language while they learn. The willingness of educators to make accommodations depends not only on their skill and knowledge but on their beliefs about teaching and learning (Scott & Spencer, 2006). Differentiation of teaching practice is held as a positive criterion to inclusive education of children with language disorders. Educational establishments are legally bound to accommodate for the needs of children with SLI which means being able to understand specific needs and identifying appropriate strategies for teaching

1.4 Significance of the Study

Children with SLI are identified as having a disability at a young age and research shows that while early intervention is undoubtedly important , the period of optimal language development may well have passed (Warren & Yoder, 1996). Regardless of intervention, many of these children continue to experience difficulties with cognitive

learning and socialisation skills. As a consequence they may face lifelong disadvantages requiring ongoing support to prevent social isolation and exclusion.

A number of children with SLI are able to gain access to specialised schools and receive intense early intervention at one of the Language Development Centres (LDCs) situated in a Perth suburb of Western Australia. Many students with SLI, regardless of a period of intense early intervention in segregated learning environments at LDCs do not reach a similar language competency level as their peers showing TLD. All children with SLI attending LDCs are eventually integrated into regular mainstream schools where they often continue to have persistent problems with language, which affects their further education. Language impairment can be a considerable disability for children when interacting with others and functioning in daily life. This is especially so if difficulties continue into adulthood.

This study examined children with SLI age 5 to 6 years understanding of semantic features related to prepositions. It compared these understandings to age matched children showing TLD and those of younger children with TLD age 4 to 5 year old. Adult understanding of the features associated with prepositions was also examined in this study. Assessment of children with SLI understanding of the features related to preposition words is vital as it impacts on the program delivered to children regardless of the educational setting. In order to differentiate the curriculum for children with SLI educators need to be aware of the needs of these children. Educators need to have a sound knowledge of the constructs of language and essentially need to be aware of how language impairment can present in each child. This important in depth research provides educators with an understanding of the needs of children with SLI in relation to learning prepositions. It also examines the pedagogical implications of teaching preposition words to children with SLI.

1.5 Overview of the Methodology

The study comprised of a number of sequential steps covering four different stages. The research approach was a mixed-methodology study using a qualitative design, adopting quantitative and qualitative research approaches (Tashakkori & Teddlie, 1998). Knowledge gained throughout the research was regarded as a constructive sign of

accumulation of awareness. This is the nature of a Heuristic approach to research (Anderson, 2005; Esposito, Ferilli, Basile & Di Mauro, 2007).

Semantic Feature Analysis (SFA) or componential analysis uses the semantic relationship among words based on descriptive attributes or lack of them (Curzan & Adams, 2009). Individual words are analysed in terms of smaller components (Aarts & McMahon, 2006). Components are the semantic dimensions, qualities or features imbedded in word meanings. Componential analysis or SFA was used in this study to examine the features or qualities of particular preposition words. Components or features related to understanding of prepositions 'in', 'on', 'under', 'over', 'behind', 'in front' 'between', 'next to', 'through', 'around' and 'across' were identified and examined.

1.6 Overview of this Thesis

The thesis has been organised into five chapters. The first chapter, the Introduction and Overview, includes a background and rationale for the study, an understanding of the context and background of the study. It also contains an overview of the research objectives.

The second chapter, The Literature Review: Language, Language Learning & Acquisition and SLI, provides extensive background information derived from current literature and research related to the theoretical and practical relevance of the study.

The third chapter, Methodology, explicates how the research focus questions were investigated and clarifies why specific research methods were employed. The chapter specifies the research questions, the participants and educational settings, data collection procedures, data analysis, issues related to validity and reliability together with ethical considerations.

The fourth chapter, Findings, presents descriptive statistics and discussion of the data collected. The study comprised of a number of sequential steps covering four different stages. This chapter presents the findings from the prototype trial in Stage 1, the data collected from the main study in Stage 2, the data collected from the participants in the Adult Trial in Stage 3 together with the mapping and comparison of

features of children showing TLD and children with SLI and features of adult norms examined in Stage 4.

Finally, chapter five, Summary, Conclusions and Recommendations, summarises and discusses the findings. It outlines implications of the findings and draws conclusions from the study. Recommendations have been stated together with suggestions for the directions of future research.

The study aimed to create awareness among educators to accommodate for the needs of children with SLI in relation to learning spatial relationships and preposition words. The understandings related to preposition words of children showing TLD and children with SLI were examined allowing direct comparisons to be made. Adult understandings related to features associated with prepositions were also explored to establish 'norms' so adults can be fully aware of how their own understandings of preposition words compares to that of children. Ultimately, the information derived from this study aimed to increase awareness in professionals of the semantic features understood by children showing TLD and children with SLI together with any pedagogical implications related to the findings. Ultimately, the study aimed to enhance the learning outcomes for children with SLI.

CHAPTER 2

Literature Review

Language, Language Learning & Acquisition and SLI

Impairment is defined as an abnormality in the way organs or systems of the body function (Foreman, 2005). As previously discussed, Specific Language Impairment (SLI) is the term used to describe children who experience difficulties acquiring and using language compared to their peers who show Typical Language Development (TLD) (Otto, 2010). Approximately 7 per cent of 5 to 6 year old children who present with difficulties in acquiring or using language meet the criteria for SLI (Bender, 2004; Hartas, 2005; Tomblin, et al., 1997). If children with non-verbal intelligence quota (IQ) levels in the range of 70 to 85 are included, the estimated prevalence of SLI is 10 per cent of 5 to 6 year old children (Tomblin et al., 1997).

Additionally, commonalities apparent in the profiles of children diagnosed with SLI that appear unrelated to these difficulties have also been examined. Bishop' twin study (1990) demonstrated a hereditary basis for the association of SLI with motor skill impairment. Hill (2001) also established that there is a considerable relationship between SLI and poor motor skills demonstrating that 40 to 90 percent of the children with SLI in the study conducted also meet the criteria for developmental coordination disorder. Kaplan Dewey, Crawford and Wilson (2001) found the performance of children with SLI on verbal and visual memory tasks was inferior when compared to those children who were only suspected of developmental coordination disorder and those children showing TLD. Kaplan et al. (2001) also found that 51.6 percent of the children with language learning difficulties met the criteria for at least one other disorder. Furthermore, it has been demonstrated that there is a high correlation between SLI and attention deficit disorders (Oram, Fine, Okamoto & Tannock, 1999).

2.1 Language and Language Structure

As previously stated, the way language is used can be divided into receptive and expressive components. Receptive language is seen to consist of spoken words that can

be comprehended while expressive language is words that are produced and collectively combined into speech in order to convey a message (Bender, 2004; Crystal & Varley, 1993). Receptive language competency is generally considered to provide a base for language use and develops before the ability to produce recognisable words and comprehensible expressive language.

2.1.1 Language Development

Language development refers to the stages that a child goes through while acquiring language (Owens, 2008). In almost all cases, children's language development follows a predictable sequence (See Chapter 1, §1.1.2).

Brown (1973) reported that despite differences in chronological age the three children in his study began to produce inflectional morphemes in their speech in essentially the same order. While the subject matter of the children's conversations differed the study showed that irrespective of the child's age the acquisition of morphemes occurred in a systematic and predictable order. Evidence suggests that the 'natural order' is independent of syntactic complexity. An obligatory context as defined by Brown is when a morpheme is required to make an equivalent grammatical sentence in adult speech, whether for linguistic or contextual reasons. The criterion for acquisition in Brown's study (1973) was 90 % correct usage of a morpheme in obligatory contexts. Brown (1973) states:

> Each obligatory context can be regarded as a kind of test item which the child passes by supplying the required morpheme or fails by supplying none or one that is not correct. This performance measure, the percentage of morphemes supplied in obligatory contexts, should not be dependent on the topic of conversation or the character of the interaction (p. 255).

Brown (1973) identified and ordered fourteen morphemes that occurred with enough regularity in children's speech that a pattern of acquisition could be established (Table 2.1). De Villiers and De Villiers (1973) convincingly replicated Brown's findings in their study of twenty one children by grading each morpheme used by the subjects according to the percentage correctly supplied in obligatory contexts.

Table 2.1.

Brown's Acquisition Order for Fourteen Morphemes

Order	*Brown's Fourteen Morphemes*
1	Present progressive verb (the "-ing" form) -- *(is) playing, (was) singing*
2	One of the prepositions *in* or *on*
3	The other preposition (*in* or *on*)
4	Regular noun plural -- *toys, cats, dishes*
5	Irregular past tense verbs -- *came, fell, saw, hurt*
6	Possessive noun -- *Daddy's, doggie's*
7	Uncontractible copula -- *Here I am*
8	Articles -- *a* and *the*
9	Regular past tense verbs -- *played, washed, wanted*
10	Regular third person singular present tense verbs -- *sees, wants, washes*
11	Irregular third person singular present tense verbs -- *does, has*
12	Uncontractible auxiliary -- *He was eating*
13	Contractible copula -- *That's mine, What's that?*
14	Contractible auxiliary -- *He's crying*

(Adapted from Lund & Duchan, 1993).

2.1.1.1 Prepositions. Prepositions are typically single morphemes, so while defined in Chapter 1 (See §1.2.5) prepositions form the focus of this study therefore discussion here is vital. They will be discussed in more detail here. Prepositions in English language serve both syntactic and semantic functions (Curzan & Adams, 2009; Owens, 2008; Raul, 1993; Winch & Blaxell, 2006). The number of permutations involving differing semantic parameters means that it is impossible (and would be meaningless here) to tabulate all possible combinations, For example "through the back window" is not semantically congruent with "through the bad times" , but the adpositional marker (the preposition) has the same syntactic function. Similarly, "on the television" has got (at least) two semantic referents although they use the same preposition) but all of these functions are accomplished using the same handful of adpositionals.

Prepositions are a closed morphological class of words that appear in the same form with regard of how they are formed in the sentence. Prepositions indicate relationships between nouns, pronouns and other words in a sentence (e.g. the cup is <u>on</u> the table). A preposition can precede nouns, adjectives and words of other classes to form prepositional phrases. Prepositions are described as closed with regard to grammatical

conditions but open semantically in terms of meaning which can change, albeit over long lengths of time (Curzan & Adams, 2009). In semantic terms, prepositions assist in referring to a relationship between the object of the prepositional phrase and the other components of the sentence. Complex prepositions are a group of words that function as a single preposition such as 'next to', 'on top of' and 'in front of' (Winch & Blaxell, 2006).

2.2 Language Acquisition and Language Learning

Children are usually exposed to language from birth and ultimately it is the way humans interact, share ideas and instruct (Emmitt, Zbaracki, Komesaroff & Pollock, 2010). An important distinction is often made between language acquisition and language learning. These terms have been defined in the glossary. The elements that combine to result in language acquisition in humans are difficult to determine with both biological and environmental aspects cited as contributors but sole credit to one or the other is not possible. All theories of language acquisition advocate some level of innateness in humans to acquire language (Carrow-Woolfolk, 1988; Chomsky, 1965; Pinker, 1984). Cognitive processing suggests a variety of different processes that need to be successfully executed for this to occur (Krause, Bochner & Duchesne, 2003). Language learning is learning about a language (Krashen, 2003).

2.1.1 The Acquired System and the Learned System

Krashen (2003) concluded that there are two independent but related systems: the acquired system and the learned system. The acquired system relates to the unconscious aspect of language acquisition and the learned system relates to formal instruction and the conscious scrutinising of language use. Krashen's 'Natural Order Hypothesis' then argues for a combination of environmental and cognitive foundations for language learning. Krashen's theory of second language acquisition focuses on the process of obtaining, retaining, and producing verbal communication. What is important to note about Krashen's theories on language acquisition and language learning is the role of motivation in the learner. Given the difficulties children with SLI experience with

acquiring language which could hinder motivation or self-confidence the 'Affective Filter' or a screen of emotion could be an additional barrier for these children.

    2.1.1.1 Critical or sensitive period. Language acquisition may also be dependent on sensitive periods during childhood allowing for optimal first language acquisition. The Critical Period Hypothesis was initially postulated by Lenneberg (1967) who stated that internal and external conditions needed to be present or absent during the period between age two and puberty (when lateralised specialisation of the language function occurs) in order for successful language acquisition or conscious language learning to occur. Kagan and Herschkowitz (2005) suggest that this critical or sensitive period and the ability to acquire language begins to diminish after approximately four years of age. Mayberry & Lock (2003) investigated the abilities of deaf and hearing adults and the effects of early linguistic experience during childhood. Fourteen deaf adults who learned sign language at an early age and thirteen typically developing adults who acquired their first language then later learned English as a second language and fourteen English speaking adults who did not experience hearing difficulties were involved in the study. These participants all showed high levels of accuracy and performed similarly on tasks regardless of whether the language used was their first or second language and whether spoken language or sign language was used. Thirteen profoundly deaf adults who had little accessible language exposure until age six or older were also included in the study. Mayberry & Lock (2003) concluded that the poor performance on tasks in this group of participants were independent of sensory-motor modality and that early language experience dramatically affects and enhances the ability to learn language throughout life. This supports the notion of a critical or sensitive period for acquiring language during early childhood. Further support for a critical period related to language development is shown in studies of children learning a second language who have been observed performing similarly to first language speakers on tests during the age of three to seven, with results on tests declining as children move towards puberty (Curzan & Adams, 2009).

    The Critical Age Hypothesis also suggests that there is a point of time in early childhood after which, despite intervention, children will find it difficult to acquire language similar to their peers showing TLD (Curzan & Adams, 2009; Kagan &

Herschkowitz, 2005). There are several recorded case studies that support the theory of a decline in ability to acquire language. The case study of 13 year old 'Genie' who after following an abusive childhood and devoid of language exposure for most of the first 13 years of her life underwent intensive intervention yet failed to master the grammatical structure of language (Curtiss,1977). Similarly, Grimshaw, Adelstein, Bryden and MacKinnon (1998) studied a 15 year old adolescent who had been profoundly deaf since birth. Following four years of using a hearing aid the adolescent still demonstrated severe difficulties in verbal comprehension and production. Rather than suggesting a strict cut off point the neurolinguistic hypothesis of a critical or sensitive period suggests a decline in plasticity of the brain which may impact on language acquisition or language learning (Clancy & Finlay, 2001; Hurford, 1991). Consistent with the view of language acquisition as innate environmental immersion in language also appears to enhance the plasticity of the brain and language development (Nelson, 1999).

2.2.2 Theories on Language Acquisition and Development

   2.2.2.1 Behaviourism. There are different theoretical perspectives on language acquisition and development (Otto, 2010). The Behavioural framework or operant condition presented by Skinner (1957) espouses that children begin with no knowledge of language but possess the ability to acquire it. A Behavioural perspective suggests that language development is a verbal behaviour (Carrow-Woolfolk, 1988; Mercer & Mercer, 2005). This view states that language is acquired through a nurture component based on stimuli, responses and reinforcement of imitation. The level of language achievement being determined by socioeconomic effects and shaping through parental input. Environmental reinforcement, it is argued, is apparent in adult feedback and responses to children's verbal attempts by way of modeling conventional sentence structures and pronunciation of words together with specific verbal behaviours rather than by correction of children's speech (Harris, 2009). A review of Skinners Behavioural framework by Chomsky (1959) argued that the complex nature of language acquisition could not be solely explained from a Behavioural perspective. The Behavioural perspective offered an explanation to language acquisition but did not account for how children were able to construct novel phrases and neither did it explain

the invention of words or stages of development such as constructing telegraphic sentences that children go through (Chomsky, 1965; Harris, 1992; Otto, 2010).

2.2.2.2 Mentalist approaches. Linguists propose that children do not learn a repertoire of phrases and sayings but it is existence of an inborn predisposition that enables them to generate an infinite number of new sentences (Chomsky, 1965; Harris, 2009; Pinker, 1984; Talay-Ongan, 2004). The universal nature of language or commonalities observed amongst languages suggests language acquisition is a natural process that has foundations in human biological innateness (Chomsky, 1965; Harris, 2009). Chomsky (1965) viewed the child as biologically predisposed to acquiring language with acquisition being triggered by exposure to language in the environment. Chomsky's work focused on language structure and marked a new perspective on language acquisition and a move away from behaviourism. Collins (2008) discusses Chomsky's proposal that linguistic competence should be credited to the ability of human beings to utilise the schema of principles and parameters that are the fundamentals for acquisition of language or the concept of 'Universal Grammar' to acquire a language in the community they live. This view supposes that children innately possess abstract syntactic structures and have the capacity to internalise rules regarding their first language grammar and syntax and memorise irregular forms (Kagan & Herschkowitz, 2005; Tomasello, 2001). Language principles are described as fixed and parameters of language as open with acquisition and competence dependant on individual exposure and experience (Curzan & Adams, 2009). Berko's (1958) study was the first to establish that young children analyse the words around them with innate mental structures. According to a mentalist perspective there is an innate capacity in every human being to acquire language in an unconscious manner rather than a conscious learning of the rules that govern language (Kagan & Herschkowitz, 2005; Lee & Van Patten, 2003).

2.2.2.3 Functional approaches. Halliday (1975) was amongst the first to suggest a functional approach to language development. Language is proposed to be acquired when it is relevant and functional. Language is seen to develop from the need of children to function in society and engage with interactions with others (Curzan & Adams, 2009; Morrow, 2009). Halliday (1975) identifies seven functions evident in the

language of young children. These are; instrumental or language to satisfy personal need; regulatory or the language to control the behaviour of others; interactional, the language used to get along with others; personal or the language used to tell others about themselves; heuristic, the language to find out about things; imaginative the language used to pretend and make believe and informative language used to communicate something for the information of others. It is suggested that the taxonomy of language functions proposed and defined by Halliday can be prompted by different settings and different types of language. Halliday's views on language acquisition established the relationship between social meaning and language form. Matychuk's study (2004) focusing on the interactive negotiation between parents and children further emphasised Halliday's functional approach to language development showing four of the seven functions to be present in the language the parents used with the child in their study.

    2.2.2.4 Constructivism. Constructivism states that children construct their own meaning through the processes of assimilation or mapping new experiences to known experiences. Accommodation occurs when old schemes are altered in response to new experiences and following a period of adjustment equilibrium a stable psychological and biological state occurs (Krause et al., 2003; Morrow, 2009; Otto, 2010). The innateness associated with language acquisition complements the ability of children to adapt and assimilate new knowledge but also suggests different learning outcomes among individual learners.

    Piaget (1954) believed cognitive development and maturation occurred in stages with children moving through concrete to more abstract understandings. Piaget gave much less attention to the role of the social interactions and focused on the role of the child's construction of the physical world. This suggests that young children need opportunities to explore their world through play and manipulative materials. Consistent with Bronfenbrenner's ecological model of human development the influences of environment need to be considered when assessing the speed and accuracy of language acquisition (Carrow-Woodfolk, 1988; Krause et al., 2003). The role of the environment in supporting and facilitating language acquisition is also described by Cambourne (1988, 1995) who identified eight concurrent conditions: immersion, demonstration, engagement, expectations, responsibility, approximations, employment and response all

of which are seen to support oral language development. If we accept the constructivism view we then need to accept the meaning assigned to language is individual but in order to successfully interact with others a shared understanding of the meaning of words needs to be reached.

   2.2.2.5 The interactionist perspective. The interactionist perspective of language acquisition focuses on the importance of reciprocal socio-cultural interactions. Vygotsky (1962) maintained that learning was a result of both biological and environmental factors and highlighted the importance of the role of a socially interactive process on children's language acquisition. Social interaction is described as enhancing language development and aiding acquisition demonstrating the importance of environmental influences working with innate structures. It is argued that children acquire language without formal teaching through interactive methods that occur through interaction with others as information is exchanged. Equally it is proposed that children are able to acquire language from listening to adults or peers or speaking to each other (Curzan & Adams, 2009; Matychuk, 2005; Otto, 2010). Communicative exchanges are part of everyday life and being part of a social system allows for intrapersonal methods of communication to set the conditions for learning sentence patterns and language acquisition. A social-pragmatic approach suggests children acquire language in the same way that other cultural understandings are acquired, during social interaction and communication with others giving them an avenue for organising information through the use of words as symbols. The interactionist perspective of language acquisition is comparable to the process of accommodation and assimilation generated by social interaction and active participation proposed in the theory of constructivism.

   From an interactionist perspective then, words are a symbolic representation of meanings and they are not learnt in isolation (Tomasello, 2001). Word meaning relates to objects, events or qualities (Lund & Duchan, 1993). Children are seen as predisposed to attempt to understand a word by assessing if it relates to a whole object. If the object label is known it is suggested that the child will move to determine if the word refers to another part of the object. It is argued that children are able to use syntactic bootstrapping to determine if the word is related to something other than the name of the object such as an event, with verbs being a priority option (Kagan & Herschkowitz,

2005). Referential intentions or pragmatic cues used by the speaker have also been shown to assist in determining reference (Baldwin, 1991).

2.2.2.6 Social-pragmatic view. A social-pragmatic view suggests that children learn to manipulate language symbols in order to understand and experience interactions. Once learnt children are then able to manipulate and produce symbols appropriate to social contexts. According to Tomasello, Strosberg and Aktar (1996) it is these social constraints that serve to assist children in language acquisition.

2.2.2.7 Social learning theory. Bandura's social learning theory (1977) states individuals learn new behaviours through a process that involves cognitive and personal influences together with observation, complementary interaction and modelling. This modelling and exposure to adult language is seen to be one paradigm that facilitates the creative practice of language structures and mastery of communication where children quickly develop systems and patterns of usage (Otto, 2010; Siraj-Blatchford & Clarke, 2000; Tomasello, 2001). Reminiscent of Bandura's and Vygotsky's theories, Krashen (2003) sees language acquisition as a natural process incorporating a social process that also incorporates cognitive systems even in second language acquisition.

While different aspects to language acquisition have been proposed each theory emphasises that children are able to acquire language by being immersed in adult language as a result of social interactive processes. Research indicates children actively try to understand the language used by adults and to make associations between words and referents (Tomasello et al., 1996). Parental use of language has been articulated in studies to be directly related to children's acquisition of vocabulary and understanding of concepts with increased frequency of word use producing higher vocabulary in young children (Goodman, Dale, & Li, 2008; Kagan & Herschkowitz, 2005). It is suggested that children's early vocabularies tend to include words that are encouraged by significant adults (Harris, 2009). Dollaghan, Campbell, Paradise, Feldman and et al. (1999) examined the influence of maternal education on language acquisition of children and found a correlation. Results could also have been explained by children's lack of experience or exposure.

Vygotsky (1962) foregrounded the importance of social interaction and the role that others have in promoting language acquisition. Different communities appear to utilise a

variety of different interactional strategies to enhance children's language acquisition (Harris, 1984; Heath, 1983; Schieffelin, 1979). In Western middle class homes with white Anglo-Saxon families specific strategies have been shown to be demonstrated by parents (Harris, 2009). Motherese, child directed speech (CDS) or parentese in these environments sees parents providing simplified predictable language structures such as shorter sentences, expanded utterances, repeated nouns, and repetition that assist children to acquire language (Painter, 1991). Some differences between the interactions of mothers and fathers and their children have been observed (Barton & Tomasello, 1994; Matychuk, 2004) but verbal interaction between children and parents or significant others are considered to aid individual language acquisition and development. Motherese is seen to serve to demonstrate the innateness described by nativists. Even though parents are reported as not correcting structure or lexical deviations children are still able to acquire more complex forms of language even when they are not directly taught (Harris, 2009). The function of child directed speech may be the combination of intuitive informal instruction and the essential nature of communication (Otto, 2010). It has been suggested that these observations show that children do not acquire language purely through interacting with the environment as suggested by behaviourists. From a pedagogical perspective this suggests that children process innate abilities to acquire language but there is a role significant adults can play in activating and influencing language development.

2.3 Language Learning Difficulties & SLI

Children with SLI have demonstrated in studies that they have smaller vocabularies and are markedly slower in their progress of acquiring language than their peers who show TLD (Bishop, 1997; Gray, 2003, 2004, 2005). Children with SLI appear to exhibit distinctive difficulties with regard to grammar (Gopnik 1990; Rice & Wexler, 1996) poor sentence repetition and repetition of non-words (Botting & Conti-Ramsden, 2003).

2.3.1 Word Learning and Cognitive Processing

Children showing TLD are generally seen to comprehend syntactic function or grammatical relationships between words and use it to determine or label objects using novel words (Jolly & Plunkett, 2008: Newman & German, 2002). Rice et al. (2000)

state that children with SLI are less able than their peers showing TLD to use syntactic bootstrapping to learn novel words.

2.3.1.1 Fast mapping or Quick Incidental Learning. Fast mapping or Quick Incidental Learning (QUIL, Oetting, Rice & Swank, 1995) is described as the ability to acquire and retain some phonological, semantic or event knowledge and can be observed in young children showing TLD who are able to demonstrate understanding of a word after only minimal exposure. There are a number of different strategies seen to be employed in order to fast map novel words (Storkel, 2001). Children showing TLD are described as being able to infer some sort of connection between a word and for instance an object or action and are able to achieve an initial receptive understanding of the new word. Therefore children need to be able to decipher which word relates to the referent and then to be able to retain the word for future use within their memory. Wilkinson, Ross and Diamond (2003) suggested that 'fast mapping' and language acquisition may occur when parents look at or point to an object and label the object, explicitly directing children towards particular information to learn.

Fast mapping of a word is consequently achieved through the child only hearing the word a minimal amount of times. Therefore new words are seen to be acquired from an indirect exposure as from an act of ostensive labelling such as someone pointing and drawing attention to the referent (Spiegel & Halberda, 2001) or even from just overhearing the word being used (Floor & Akhtar, 2006). As a result when presented with a new word or novel situation it is suggested children may reason that being familiar with or knowing what other referents are will enable them to deduct what the novel referent might be (Golinkoff, Mervis, & Hirsh-Pasek, 1994; Markman,1989). An associational strategy is described as being employed and relates to an understanding of word order within the sentence which may give clue to the meaning of the novel word (Owens, 2008). Slow mapping as described by Carey (1978), adds to this initial word acquisition providing a deeper understanding or lexicon and automaticity in using language. Children with TLD are shown as acquiring new vocabulary implicitly and often without prompting (Gershkoff-Stowe & Hahn, 2007; Oetting et al., 1995; Wilkinson et al., 2003). Children who do not have SLI are said to initially fast map a word that may be heard incidentally or though explicit teaching. Results from a study by

Gray (2004) demonstrated that fast-mapping ability could possibly be used as a screen for poor word acquistion.

A variety of studies which assessed children showing TLD and children with SLI ability to acquire novel words have shown that words are acquired at equal rates when only a few words are expected to be learnt. As the number of new words increased, children with SLI were not able to acquire them at the same rate as children showing TLD (Alt & Gutmann, 2009). Developing word meaning consequently consists of a longer process which brings a deeper meaning to vocabulary or a lexicon and successful lexical achievement is vital to oral and written language development (Kearns, 2000).

2.3.1.2 Non-word repetition. A variety of different cognitive processes are suggested as necessary for word acquisition to occur (Krause et al., 2003). Harris (2009) proposes that language acquisition can be assisted by being able to perceive the sounds within words, then being able to generate and combine these sounds. It is generally accepted that children with language impairment have a neural dysfunctional component and it is expected that these children have short term memory difficulties which could cause a barrier to retaining the sounds within spoken words (Archibald & Gathercole, 2005; Botting & Conti-Ramsden, 2001; Carrow-Woolfolk, 1988; Ullman & Pierpoint, 2005). Studies involving non-word repetition tasks or tasks that require words that have no meaning such as e.g. *'warblit'* to be repeated, have received considerable consideration from researchers. Research has suggested that non-word repetition tasks may hold the potential to highlight underlying difficulties that children with SLI have together with providing an avenue for identifying children with SLI (Archibald & Gathercole, 2007; Coady & Evans, 2007; Estes, Evans & Else-Quest, 2007). Detailed analyse of error patterns from studies conducted suggest that non-word repetition of children with SLI stemmed from difficulties creating phonological representations rather than difficulties in speech perception or production (Coady & Evans, 2007). While there are a variety of processes involved when repeating non-word tasks, researchers argue that reduced ability to repeat non- words indicates difficulties in phonological working memory or processing sounds which could underlie language impairment (Archibald & Gathercole, 2007; Coady & Evans,2007; Estes et al., 2007).

Glogowska, Roulstone, Peters and Enderby (2006) showed that many of the children who present with communication difficulties were in fact achieving scores within the normal range on standardised assessments by the age of seven to ten years. Glogowska et al. (2006) revealed that about 30 % of the children assessed during their study continued to have difficulties with acquiring and using language which was also impacting on their literacy skills. The children also exhibited social difficulties due to their communication difficulties. Similar studies of students who were identified in early childhood with SLI show sustained difficulties with academic subjects such as reading together with social and behavioural difficulties (Botting, Simkin & Conti-Ramsden, 2006). Language skills at age seven are described as having an impact on reading skills at age eleven (Botting et al., 2006). These studies indicate the long-term nature of SLI and indicate the need for awareness among professionals in child development and education of the ongoing needs of this group of children.

2.3.2 Spatial Words and Concepts

Children with SLI have particular difficulties acquiring and using the closed class group of words prepositions (Grela, Rashita & Soares, 2004). Prepositions assist in referring to relationships including time, place, where something or someone is, direction or where someone or something is going. Grela et al. (2004) evaluated the proficiency of children with SLI in using prepositions. The study concluded that while children with SLI understood the syntactic function of prepositions, they had sustained difficulty with the semantics of these words (Grela et al., 2004). Studies have demonstrated that children with SLI do not 'fast map' novel words at the same rate as children with TLD and do not rapidly infer a new word's meaning. Rice, Oetting, Marquis, Bode and Pae (1994) showed that the children with SLI in their study required more repetition of a word to consolidate acquisition and to generalise use of the word. Prepositions are words that link nouns, pronouns and phrases to other words in a sentence which can promote a strong inclination by children with SLI to omit them when speaking (Grela et al., 2004; Marina, Befi-Lopes & Takiuchi, 2005).

Piaget conducted many experiments related to children's spatial schemata concluding that the development of cognitive structures related to spatial concepts is a

long process that takes until adolescence to fully form (Piaget & Inhelder, 1948; Piaget, Inhelder & Szeminska, 1948). A Piagetian perspective on development of spatial concepts sees children extend on their early sensorimotor understandings of containment, 'in' and contact 'on', then topological relationships between objects and finally projective and Euclidean space. While Piaget's conclusions related to determining the process of spatial development related to children's shift in intellectual understandings from intuitive to abstract are profound, the experimental techniques used may be considered to lack meticulousness (Laurendeau & Pinard, 1977). It is suggested that early spatial words are mapped onto established spatial concepts and studies illuminate children as young as nine months old can understand spatial concepts even if they cannot verbalise (Liekin, 1998; Meints, Plunkett & Dimmock 2002; Rohlfing, 2006). In order to relate to spatial objects and comprehend spatial relationships children need to have an understanding of objects within their environment. Piaget states that children build on their knowledge of sensorimotor space or the ability touch to recognise objects and then they begin to act upon objects and finally are able to cognitively manipulate objects.

According to Levinson (2003), there are three frames of reference for encoding projective relationships between objects or self and objects. Levinson states that the absolute reference frame uses uniqueness of the environment to orient the axes, the relative reference frame uses the observer (speaker or listener) and the intrinsic reference frame uses the internal axes of the reference object. There are significant differences in languages regarding which frame of reference is used to describe spatial relationships with different languages giving more importance to one type of reference frame than another (Levinson, 1996).

2.3.2.1 Universal primitives. Children learn spatial words and then use words to express understanding of spatial concepts. Universal primitives related to spatial concepts that have been suggested include containment, support, contact, opening and closing, horizontality, verticality and path (e.g., Bloom, Lifter, & Broughton, 1985; Clark, 1973b; Nelson, 1974; Sinha, Thorseng, Hayashi, & Plunkett, 1994; Talmy, 1985). Bowerman and Choi (2001) propose that these categories are innate and children build

on their understandings as they acquire language. It is proposed that increased language acquisition drives the development of spatial categories.

Essentially objects are able to be perceived and acted upon in similar ways regardless of what language is used within the culture. The question of whether children map known concepts to language or if language actually shapes spatial concepts has been explored by studies such as those conducted by Bowerman and Choi (2001). They assert that innate predispositions for concepts of space alone do not determine spatial categories. The way a particular culture uses language can differ. The work of Bowerman and Choi (2001) showed that different languages focus on different aspect of the physical properties of objects in order to assign categories of space.

Choi (2006) conducted a contrasting study between very young children whose first language was English and children whose first language was Korean in order to assess how different cultures described spatial configurations. Those children from an English speaking background were assessed at 18, 24, 29 and 36 months and those children from a Korean language learning background were assessed at 29 and again at 36 months of age. Korean children distinguish between actions resulting in an interlocking, tight-fit relation such as a top on a pen (*kkita*), and those resulting in a loose-fit relation, such as an apple in a bowl (*nehta*) or a teacup resting on a saucer (*nohta*). This study showed that young children from language backgrounds begin with an ability or sensitivity to clearly differentiate between different types of containment 'loose-fit' (objects loosely contained within the boundary of another) and 'tight-fit' (objects that fit tightly inside another). It was shown that as the word 'in' is acquired to describe conditions of containment, either loose or tight as in the case of the English language the sensitivity to differentiate between features between these notions of 'in' diminish. This is in stark contrast to children who are exposed to a language that includes a specific term for the features of a loose fit containment or a tight fit containment of an object. In essence the very same event can be described differently depending on the language. It is the interplay between language of the culture that influences and characterises these categorises.

2.3.2.2 Semantics. Semantic knowledge is seen to be the understanding of word labels that relate to concepts and semantic networks or schemata which are the thought

process that organise the conceptual knowledge (Otto, 2010). Semantic memory is agreed knowledge concerning the world we live in that includes features and categories and relationships between them (Crystal & Varley, 1993). In acquiring concepts children learn that objects or actions of a similar nature can be bound together collectively in categories (Otto, 2010). Increasing semantic representations are said to enable semantic networks to form (Kagan & Herschkowitz, 2005). There are many different theories and models as to how semantic memory is formed, how information is stored and how words are retrieved (Krause et al., 2003; McInerney & McInerney, 2002).

2.3.2.3 Prototypicality. Prototypicality assumes that less typical examples of a concept have different features remote from the exemplar (Aarts & McMahon, 2006; Curzan & Adams, 2009). Conceptual categories allow humans to organise and group objects or features of objects. This ability to categorise features or allows efficiency in storing information, retrieval of information and linguistic proficiency (Roth & Bruce, 1995). As the process of semantic categories emerge such as those related to prepositions, representations for categories are stored in the memory.

There are different approaches proposed related to how features are defined and concepts are formed. Collins and Quillian (1969) advocate that hierarchical organisation of domains occur. This suggests that a subordinate example within a category or concept inherits the features. The 'defining feature approach' suggests that features of any object or concepts are mentally represented and that all people mentally represent concepts in the same way. This approach to conceptual development suggests that by grouping concepts or objects together clear delineated boundaries are created and remain stable. Unfortunately this model fails to account for individual differences in experience or misconceptions. Rosch (1973b, 1975b) purported that typicality is central to the way we represent and categorise categories. 'The fuzzy concept approach' discussed by Lakoff (1987) suggests that typicality associated with an object will depend on context. Therefore preposition words could have mental abstractions of typical features or essential properties that are associated with meaning.

Children are not able to use relational terms until they have a knowledge base related to objects or events which enables them to make these connections (Bates &

Goodman, 2001). Studies related to acquisition of prepositions in children reveal that this class of words is acquired comparatively late in contrast to acquisition of nouns or verbs (Tomasello, 1987). Children begin with a core meaning for words and make associations with typical situations first and gradually extend and encompass more exemplars (Meints, Plukett, Harris, & Dimmock, 2002; Sinha et al., 1994). This can be likened to how children learn nouns with prototypical examples becoming starting points for lexical development (Meints et al., 1999). Herskovits' theory (1986) claims that the relationship indicated by a particular preposition is then altered by the nouns involved to reflect a more distinctive meaning clustered around a core meaning with peripheral meanings that depend on context. Therefore understandings of individual prepositions may be centred around a central meaning with peripheral meanings that depend on context and the language that supports it. Although nouns may not offer sufficient context on every occasion, the nouns serve to limit the range of interpretations for a particular preposition.

2.3.3 Norms and Assessment

Individual early identification of language difficulties in learning prepositions can inform pedagogical planning for intervention (Bender, 2004; Carrow-Woolfolk 1988; Lund & Duchan, 1993). Paul (1995) provides a checklist for spatial prepositions. The developmental checklist of spatial terms is very general and includes eight prepositions listed alphabetically. Paul suggests that each preposition is comprehended by children with TLD by the age of three years. The checklist does not describe the pattern of development of features related to acquiring these prepositions, show if the features of one preposition are more complex or difficult to acquire than another, demonstrate if the features of particular prepositions are acquired before another or if a particular feature of prepositions is a pre requisite to acquiring another. The checklist in Paul (1995) also does not state how the sequence of spatial concepts listed was developed.

Bowerman & Choi (2001, p 478) state 'topological notations of containment (in), contiguity and support (on) and occlusion (under) emerge first, then words for notions of proximity (next to, beside, between), and finally words for projective relationships (in front of, behind)'. Bowerman & Choi (2001) acknowledge that patterns of language

acquisition is consistent and their research has fully explore the concepts and conditions for learning within the English language and Korean related to the prepositions 'in' and 'on'. Telleen & Wren (1985) state prepositions related to notions of proximity e.g. 'between' are listed as more difficult to learn than for words such as 'in front of' or 'behind' related to projective relationships that are suggested to occur earlier. Many different interpretations of the preposition 'over' have been identified demonstrating that this preposition has multiple meanings (Tyler & Evans, 2001; Van der Gucht, Willems & De Cuypere, 2007). Studies have also examined the opposite terms 'behind' and 'in front' demonstrating symmetrical placement of objects and confirming common agreement that the space between an object and self was 'in front' and the location on the far side of the object was interpreted as 'behind'. (Cox, Batra & Singal (1981; Durkin, 1981; Harris & Strommen, 1972). Johnston (1984) states that rather than a particular spatial relation between two objects the meaning of 'behind' for the young child appears to be related to the non-visibility of an object and the meaning for 'in front' related to visible. Telleen and Wren (1985) also cite a list of prepositions by Aaronson, Phillips & Bertolucci (1980) which contradicts the research by Bowerman & Choi (2001). As demonstrated, the literature related to later acquisition of preposition words reflects the emergent nature of children's learning about spatial concepts and the mapping to spatial words as culture and environment influences have a hand in the order of acquisition for each individual child. While the literature is extensive in exploring how some prepositions such as 'in and 'on' are acquired there is a lack of exploration of the configuration of semantic features used in determining understanding of later prepositions or how these features might fit within the developing lexicon related to spatial concepts.

There is currently limited standardised testing available related to semantic performance other than to assess vocabulary size (Brackenbury & Pye, 2005). Commercial assessment tools, such as the 'Peabody Picture Vocabulary Test (PPVT-4)' (Dunn & Dunn, 2007) and the 'Clinical Evaluation of Language Fundamentals' (CELF) (Semel, Wiig & Secord, 2003). Peabody Picture Vocabulary Test' ("Peabody Picture Vocabulary Test", 2009) language assessment tools detect children's language ability but specifically concentrate on measuring vocabulary, nouns, verbs and attributes. The

CELF includes a specific subtest component for prepositions and assesses some prepositions but does not provide a sequence for learning, a hierarchy of concepts or features related to specific prepositions. The presentation of both the 'Peabody Picture Vocabulary Test' and the CELF requires children to judge the acceptability of a specific verbal label for selected objects or pictured objects or events. This could facilitate the use of syntactic bootstrapping when answering. Assessment tools that require the child to listen to a verbal description then select the picture that best matches a concept such as 'in the box', or 'under the big tree 'may not provide the examiner with a true reflection of generalised concepts related to direction, position or location if the child relies on choosing the correct noun instead of the correct direction, position or location of an object (Wiig & Semel, 1980). There is currently no commercial assessment of features related to understanding of prepositions or semantic feature analysis of prepositions.

The aim of this study is not to develop a new assessment tool but to identify semantic features associated with individual preposition words. Preposition words in sentences can be used to identify relationships in space and position or locates something in time e.g now, then, before. Prepositions can also take on new meaning when in combination with verbs they are known as prepositional verbs e.g. 'put on', 'put up with'. No prepositional verbs were included as target prepositions and only children's understanding of 'concrete' locative prepositions are studied in this thesis. In order to determine current levels of knowledge related to prepositions individual evaluation of semantic understandings in children is necessary. As previously stated, standardised testing only assesses vocabulary size (Brackenbury & Pye, 2005). Previous studies focusing on assessment of language ability in children with SLI have been essentially quantitative. They have examined, for example, mean incidence in spontaneous language samples for vocalisation patterns, phonetic inventories, and syllable formation patterns (Rescorla & Bernstein Ratner, 1996) and so on. Evaluation of proficiency with the use of prepositions in children with SLI has been conducted by matching mean length of utterance with that of children with TLD (Grela et al., 2004). Comprehension of prepositions has also been assessed by using parental questionnaires and preferential looking tasks (Meints, Plunkett, Harris & Dimmock, 2002). While these approaches

may show the final results there is a clear methodological problem as they only provide scant information on why specific results occur. This would be especially true for children with SLI who experience difficulties acquiring spatial concepts and attaching meaning to preposition words. If these understandings can be uncovered we may begin to see any pedagogical implications which arise from the degree of fit between the semantic features used by children with SLI and children showing TLD

CHAPTER 3
Methodology

As noted above, children with Specific Language Impairment (SLI) experience difficulties learning the closed class set of words that are prepositions. A selection of target prepositions was used in the main study. To examine the understandings these children have this study aimed to identify and examine how semantic features are configured by children diagnosed with SLI. These understandings were compared and contrasted to those of children showing Typical Language Development (TLD) and to those of adults.

This chapter provides a detailed overview of the study. It specifies the research objectives and questions, the participants, selection and recruitment of participants, educational settings, data collection procedures, data analysis, issues related to validity and reliability together with ethical considerations.

3.1 Overview of the Research

This study aimed to develop an understanding of the relationship of features and beliefs that underlie the understanding of prepositions. The study comprised of a number of sequential steps covering four different stages.
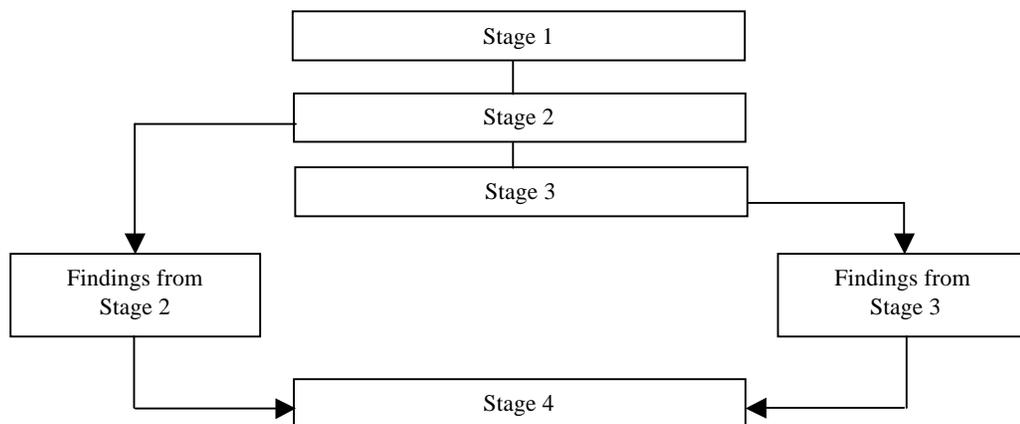
Figure 3.1. The research study stages and a sequence of the study proceedings.

Stage 1 (See figure 3.2) involved consulting the current literature associated with preposition acquisition and developing a set of preposition words that became the first target words. An initial protocol was developed and subsequently trialed in the prototype which was conducted with children who showed TLD age 4 to 5 years. Review of the findings from the prototype allowed modifications to be made to the protocol used and setting of the preliminary benchmark of semantic features for children with TLD age 4 to 5. Subsequent to the trial in Stage 1 modifications were made to the protocol.
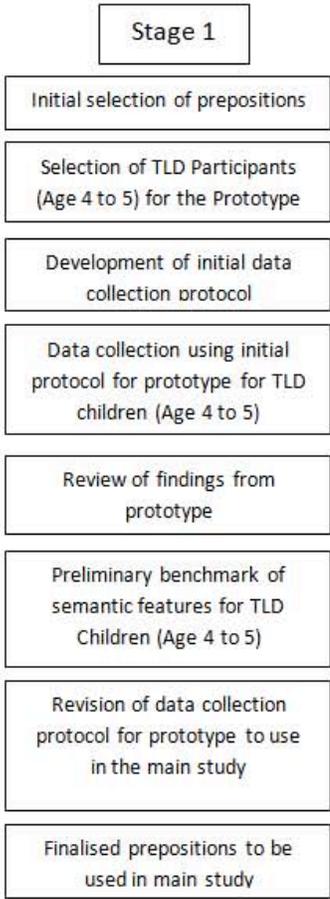
Figure 3.2. The research study components and a sequence of proceedings for Stage 1.

In Stage 2 (See figure 3.3) the final protocol was administered to children showing TLD age 4 to 5 years and children with TLD age 5 to 6 years in the main study. Data was collected from these cohorts and analysed. As a result of the identification of the semantic features configured by these groups children with specific language impairment (SLI) age 5 to 6 years were recruited and the final protocol was administered. This data was analysed. The data from all children involved in the main study was examined and this assisted in the development of the Adult Instrument in Stage 3 (See figure 3.4). The Adult Instrument aimed to further explore semantic features associated with prepositions and establish adult norms related to the configuration of these features. The data from the Adult Instrument was collected and analysed.

Stage 2

Selection of TLD participants
(4 to 5 years and 5 to 6 years)

Data collection TLD
(4 to 5 years and 5 to 6 years)
participants for main study

Identify semantic features

Selection of SLI participants

Data collection SLI
(5 to 6 years) participants for
main study

Identify semantic features
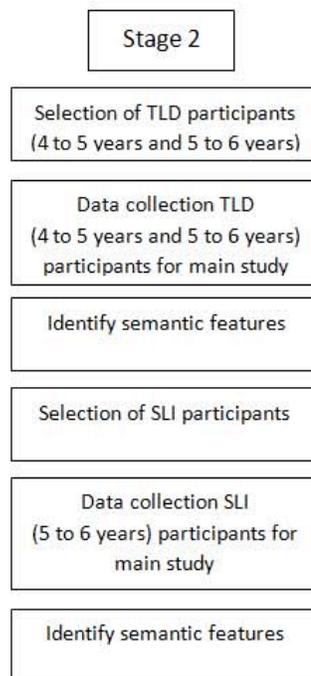
Figure 3.3. The research study components and a sequence of proceedings for Stage 2.

Stage 4 (See figure 3.5) involved comparing and contrasting the findings from the children in the main study children with the analysis of the data from the participants who participated in the Adult Instrument.

Figure 3.4. The research study components and a sequence of proceedings for Stage 3.

3.2 Research Objectives and Research Questions

The study examined how semantic features are configured by children diagnosed with SLI and children with TLD in their understanding of prepositions. Adult understanding of prepositions was examined as a measure of the semantic features perpetuated in socio-cultural contexts, namely within a western culture in Australia. The study also aimed to examine pedagogical implications related to children diagnosed with SLI and children with TLD understanding and configuration of these features related to prepositions.

Specifically, answers were sought in relation to the following research focus questions:

1. How are semantic features configured by children who show typical language development in their understanding of prepositions?
2. How are semantic features configured by children with an identified language impairment (SLI) in their understanding of prepositions?
3. To what extent do the semantic features used by children with an identified language impairment (SLI) and those used by children who show typical

language development in their understanding of prepositions map onto each

other?

4. Are there any pedagogical implications which arise from the degree of fit

between the semantic features used by children with SLI and those of children

who show typical language development?

3.3 Research Approach

This is a QUAL + quant mixed methodology study. An overall qualitative design
was used within which quantitative methods were employed. Qualitative methodology is
grounded in an interpretivist paradigm where reality is socially constructed (Glesne &
Peshkin, 1992). Leedy and Ormrod (2005) state that qualitative research allows the
researcher to gain an insight into multiple perspectives held by different individuals
enabling the researcher to become more experienced with the observable facts and
generate detailed thick descriptive information of the experience while an evolutionary
nature of enquiry is conducted. Qualitative research involves analysis of data such as
words or actions (Best & Kahn, 2003; Fraenkel & Wallen, 2003). In this study
qualitative data were collected from child participants in the form of observations and
field notes. Cohen and Manion (1992) contend that recording observations is a superior
method of collecting information related to data linked to non-verbal behaviour.
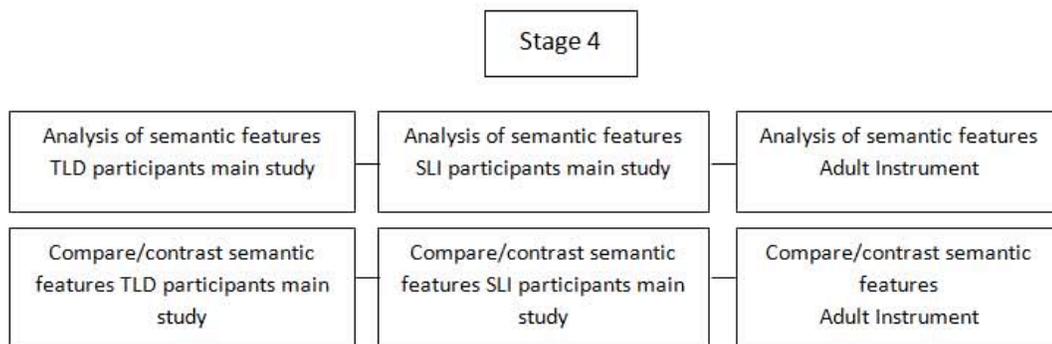
Figure 3.5. The research study components and a sequence of proceedings for Stage 4.

Observations were analysed using Semantic Feature Analysis (SFA). Semantic Feature Analysis or componential analysis involves identifying the features of lexical items which differentiates them from other often similar lexical items. Componential analysis is a widespread linguistic model that involves characterising the semantic differences between different semantic features (Durbin, 1972). Lexical semantics is concerned with meaning from individual words. A word or word form is defined as a string of letters with pragmatic or semantic meaning as opposed to a morpheme, which is the smallest unit of meaning (Aarts & McMahon, 2006). Compositional semantics is related to meaning derived from a group of words or a sentence with discourse the cumulative use of continuous speech (Aarts & McMahon, 2006). Semantic construction is detached from and not reliant on the analysis of linguistic structure.

Componential analysis uses the semantic relationship among words based on descriptive attributes or lack of them (Curzan & Adams, 2009) or analyzing the word in terms of smaller components (Aarts & McMahon, 2006). While the components or features may differ depending on the lexical class of words this indicates that word meanings can be described in terms of distinct components. Wittgenstein (1953) suggests defining features for some words may be challenging due to the indistinct features that can be attributed. The word 'game' is cited as an example. Wittgenstein also suggests that the unity of concepts depends on family resemblance where some features are shared but there may be no features shared by all members. The encoding of cognitive structures has been the subject of a number of studies such as spatial reference points (Rosch, 1975a) colours and shapes (Rosch, 1975b; 1975c) and family resemblance (Rosch & Mervis, 1975). Prototypicality effects and selecting components assume that less typical examples have different features (Aarts & McMahon, 2006; Curzan & Adams, 2009).

Components are the semantic dimensions, qualities or features imbedded in word meanings and the features are those aspects that are shared within a society or culture that define and are necessary for a category or concept to exist. Language or words describe the components or features and often these components are binary pairs with one being designated the marked form [+] and the other the unmarked form

[-] (Jeffries, 1998). Analysts such as Frake (1961; 1969 as cited in Durbin 1972) and Conklin (1955; 1962; 1969 as cited in Durbin 1972) have assumed that components have binary distinctions suggesting that all features are either present or absent. Goodenough (1956) and Lounsbury (1956) characterised the component as opposed values (e.g. male versus female) of a semantic dimension (i.e. gender). Componential analysis has been successfully applied to kinship terms (Goodenough, 1956; 1967; Lounsbury, 1956) pronouns (Trager, 1967) and verbs (Francis & Matthews, 2005). This extended the structural view of language from phonology and grammar to include semantics (Jeffries, 1998). Componential analysis can be problematic if a structural perspective is taken and features are forced into a binary pattern (Jeffries, 1998). Binary features may not always be the best way to analyse a semantic field and may result in some relevant and important features being omitted. The term quantitising describes the method of transforming or converting qualitative data (Tashakkori & Teddlie, 1998). The presence or absence of semantic features configured by children in Stage 1 and Stage 2 was quantified. Similarly data from adult responses in Stage 3 was also quantified.

Semantic Feature Analysis provided a principled and systemic approach to examining ways in which concepts associated with prepositions are mentally configured amongst (and within) groups of children and for individual children. Representation and mapping of these concepts were displayed as descriptive data. Semantic Feature Analysis provided a visual representation of identified features associated with individual prepositions. That is review of the descriptive data through 'eyeballing' can reveal patterns of semantic features related to preposition words and the conceptual nature of these patterns.

This study used a Heuristic approach employing abductive inference strategies. Broadly, abduction refers to reaching conclusions or making judgement from findings (Anderson, 2005; Esposito, Ferilli, Basile, & Di Mauro, 2007). Abductive inference, therefore, is a reasoning process that aims to uncover new rules or patterns that elucidate what is observed (Aliseda, 2003). A heuristic methodology demands that the researcher be open to discover what emerges from the data collected. Therefore, the data collected during each stage of the study prefaces further discovery and research. The inquiry here was abductive allowing for growth of thought and acceptance of new ideas. A

conclusion was made about any unusual findings that generated new conceptual paradigms. The procedure of incremental discovery allowed conclusions to be formed and allowed an in depth understanding of what was being investigated.

3.4 Procedure

This research study was conducted in four stages. Evaluations were made from the data collected in each stage which informed further research and data collection. The following is a detailed dissemination of each stage of the research.

3.4.1 Stage 1: Preliminary Design and Trialing

3.4.1.1 Initial selection of preposition. Prepositions are a closed class morpheme and are considered resistant to change or inclusion. These words exist within specified syntactic categories or the relationships between words in sentences and phrases and are considered to be limited in number (Bender, 2004). The target list of prepositions used in the prototype were; 'in', 'on', 'under',' over', 'behind', 'next to', 'between', 'through', 'around'. The prepositions 'in', 'on' and 'under' were chosen because as suggested in the literature these words describe some of the earliest spatial concepts acquired by children and are amongst the earliest prepositions used in children's speech (Bowerman & Choi, 2001; Brown, 1973; Owens, 2008; Rohlfing, 2006). Subsequent to early prepositions being acquired it is suggested that words for notions of proximity such as 'next to', 'beside', 'between' and finally 'in front of', 'behind' or words for projective relationships are used (Aaronson, Phillips & Bertolucci, 1980; Bowerman & Choi, 2001; Telleen & Wren, 1985). Other prepositions namely 'between', 'through' and 'around' were selected to examine different aspects of spatial concepts such as those related to a proximity relationship with other objects (between) and movement and direction (through/around). Universal primitives associated with spatial concepts include containment, support, contact, opening and closing, horizontality, verticality and path (e.g., Bloom, Lifter & Broughton, 1985; Clark, 1973b; Nelson, 1974; Sinha et al., 1994; Talmy, 1985). Terms that explored the subtleties of these semantic primitives related to prepositions were not included e.g. 'above' (over), 'below' or 'beneath' (under), 'beside' (next to) (Ghiselli-Crippa, Hirtle, & Munro, 1996).

3.4.1.2 Selection of participants age 4 to 5 years showing Typical Language Development for the prototype. To investigate Research Question #1 in Stage 1 the researcher collected data from 33 (15 males and 18 females) children showing TLD. These children ranged in age from 4 to 5 years (See Table 3.1). Purposive sampling enabled the researcher to select participants that were uniquely suited to the study (Best & Kahn, 2003). These children attended a mainstream school. All participants only spoke English and came from English speaking educational backgrounds.

3.4.1.3 Development of initial protocol. The prototype involved the collection of data related to the semantic features of preposition words included in the target list during one on one interaction with children. The prototype included providing children with a set of objects (Appendix A). They included a circular cookie cutter (7cm diameter, 2.5. cm depth), plastic circular container (height 8cm, 10.5 cm in diameter) with a blue matching screw on lid (11 cm diameter, 1.5 cm depth) , a small plastic toy (a mouse standing upright dressed as an astronaut, 4 cm height), a plastic Lego door (Plastic frame with hinged door, 1 cm breadth x 4 cm width x 6 cm height), two pieces of Duplo (3cm x 2 cm). The initial protocol used in the prototype described the procedure and a set of prompts consisting of sentences (Appendix B). Each sentence prompt included one of the target preposition words. The prompts listed in the protocol were administered by the researcher. This was in opposition to observing children in natural settings and waiting for the children themselves to demonstrate features of prepositions. While naturalistic observation of the nature and use of the target preposition words could have yielded rich data, according to McShane (1991) there are some limitations to this method of data collection. The data collected in this stage of the study was through experimental evidence as it was seen as a superior method because it was explicitly targeted at eliciting specific information related to prepositions. This enabled an insight into what actual meaning together with the categorisation or features the child has mapped to the concepts or words.

Children were provided with real objects to manipulate in order to demonstrate their understanding of the target prepositions after each prompt. Washington and Naremore (1978) examined children's comprehension of prepositions and concluded that children performance increased when presented with objects to manipulate rather than picture

prompts. Durkin (1981) suggests it is often necessary to formulate many explicit tasks to investigate children's comprehension of the same word to avoid reaching incorrect conclusions when using task specific problems. This need to provide many individual specific tasks was avoided by providing children with objects that can be used in an open-ended manner allowed participants to demonstrate their own understanding of a given word such as a preposition.

In this study the objects that were provided to each participant in Stage 1 for them to arrange or move during the prototype demonstrations were everyday familiar items that potentially enabled the child participant to use each of them in many different ways. The objects could be used functionally to demonstrate containment possibilities of occlusion and proximity and were able to be positioned vertically, horizontally or in projective order. The objects provided to the participants allowed them the opportunity to demonstrate features of their understanding of individual prepositions that describe the location, relationship to another object or the movement of an object by freely manipulating and positioning the objects.

Table 3.1.

Children Aged Four Years to Five Years Showing Typical Language Development Included in the Prototype

Number of participants	Age Years	Months	Male	Female
2	4	0	2	0
4	4	1	2	2
3	4	2	1	2
2	4	3	1	1
3	4	4	2	1
1	4	5	0	1
2	4	6	2	0
5	4	7	3	2
3	4	8	1	2
1	4	9	0	1
4	4	10	2	2
3	4	11	1	2

The research method allowed the researcher to observe the movement and placement of the objects related to these prepositions as participants were actively engaged. The following is a detailed description of the prototype or trial of the initial protocol administered in Stage 1 used with children age 4 to 5 years showing TLD. Each prototype session was conducted with individual child participants by the researcher in a private room. The researcher visited all classrooms prior to conducting the sessions, spending time working or playing with the children. All sessions were conducted in surroundings familiar to the children. The researcher gave verbal prompts and children were able to respond using a collection of objects to display features related to individual prepositions as set out in the initial protocol. The focus of this study was the configuration of features related to prepositions not verbalisation therefore the manipulation of objects by the participants following verbal prompts from the researcher was preferred. If the researcher had deliberately placed objects or moved objects and then asked the child 'Where' questions this may have only elicited deictic prolocatives, such as 'here' and 'there' responses (Durkin, 1980). This would not convey self generated configuration of features by the participants. Children would also need to possess the question form related to 'Where' if it was used to elicit a response.

The researcher sat next/adjacent to the participant. The researcher was then able to view objects and placement of objects from the same perspective as the participant. This eliminated the possibility of the child demonstrating features of their understanding of prepositions using objects and the perspective of the researcher being different to the participant e.g. sitting opposite.

Durkin (1981) in his study related to school children's use and comprehension of prepositions, revealed the failure of participants to touch and separate objects placed by the researcher. This was described by Durkin as possibly due to the reluctance of the children to carry out actions if they were not explicitly given authority to do so. This researcher gave explicit verbal consent for the participants in this study to be able to touch and move the objects or to use objects in the environment including themselves. This instruction was included in the protocol to avoid lack of demonstration being assumed to stem from non acquisition of prepositions rather than the participant believing they did not have permission to manipulate objects.

The researcher named the target object to be used in the demonstration to the child before each prompt. The term target refers to the head of a locative expression (the object which is being located by that expression). The target object was always the toy mouse. The placement or movement of the toy mouse or the participant moving other objects to suggest relationships with the mouse was what was being recorded or observed and the researcher making the choice of the target object to use was not perceived as impacting on the prepositions being demonstrated by the participants. Participants were also given explicit instructions to use the toy mouse to demonstrate prepositions e.g. "Make the mouse go around something" "Put the mouse under something" "Put the mouse next to something". The objects on the table were collectively referred to as 'something' and individual objects available to use in demonstrations were not named so the researcher did not influence participant's decision in making selections.

The preposition 'in' is recognised as an early acquired preposition (Bowerman & Choi, 2003; Clark, 1973b; Owens, 2008). The prompt "Put the mouse in something", designed to elicit demonstration of the preposition 'in', was chosen as the first protocol prompt. It was anticipated that due to the age of the children included in Stage 1 of the study most of them would have acquired an understanding of 'in' and therefore be able to demonstrate this using the objects. Including 'in' as the first preposition in the protocol aimed to try and ensure success for the participant. In addition it was felt by the researcher that if the children were successful they would also quickly develop an understanding of the protocol being used i.e. I ask you to do something and then you need to do something with the target object which is the toy mouse. The other prepositions included in the prompts of the protocol were ordered to isolate each preposition and assist in features of opposites not being connected such as 'in front' and 'behind' and 'under' and 'over'.

The researcher did not make eye contact with the participant while demonstrations were being made as referential intentions or pragmatic cues by the researcher may have assisted in determining reference for the participants (Baldwin, 1991).

3.4.1.4 Data collection using initial protocol for prototype for children age 4 to 5 years showing Typical Language Development. The researcher had originally listed set criteria for children to meet when they responded to the prompts by manipulating objects. Further discussion related to adopting this approach and the possible threat to external and internal validity if conducted in the main study is included in the Stage 1 Prototype Information (Appendix C).

The researcher observed and recorded the features related to the configuration of objects selected or actions demonstrated by participants in the prototype. Following each protocol prompt field notes of observations in relation to the behaviour of the children including actions, gestures, interactions with objects and the setting were made by the researcher. Observational data such as diagrams of the placement of objects by the participants and written observations of features demonstrated in the form of field notes were recorded immediately as opposed to mental notes which aim to increase the accuracy of the data collected (Glesne & Peshkin, 1992). The approach to quantitising the qualitative data included quantifying the presence or absence of a theme in a sample. This gave an insight into the acquisition of features acquired by children in relation to their understanding of prepositions.

Spontaneous movement of objects by the participants was deemed a way of showing that an understanding related to a preposition word had been gained. After each prompt the researcher waited and used intuitive judgement to recognise when the child had completed moving or placing objects. Data from children who attended the sessions but treated the sessions as a game and just played or used the materials for construction, showed signs of incomprehension or refusal to complete tasks was not used in the analysis. Occasionally the researcher asked participants if they had finished if children appeared to place or move objects then continue to move and place objects or they simply manipulated any of the objects for an extended amount of time in a repetitive or random fashion. This data was not included in the analysis. Children who responded to prompts generally stopped manipulating the objects, looked at the researcher and often made conclusion statements such as "There" [4 yrs 5 mths 24 dys. Participant 30 Prototype], or "That's in" [4 yrs 7 mths 14 dys. Participant 13 Prototype], or "Look" [4 yrs 10 mths 11 dys. Participant 23 Prototype], or "That's too hard" [4 yrs 1 mths 9 dys.

Participant 20 Prototype], or "I don't know" [4 yrs 6 mths 10 dys. Participant 53 Prototype], "What's next to?" [4 yrs 2 mths 1 dy. Participant 12 Prototype], "Can't do between' [4 yrs 0 mths 5 dys. Participant 23 Prototype]. Individual demonstrations of each prompt including a preposition word were considered complete when children spontaneously moved or placed objects and then stopped. If a prompt was given and a participant did not attempt to move objects or configure features these were considered to be unknown prepositions. No feedback was given to the children about movement or placement of objects.

When all prepositions prompts used in the prototype had been stated and the protocol had been completed, the session was considered complete. Where permission to share information with classroom teachers was given by parents/caregivers the researcher met with the teacher to discuss the findings related to demonstrations made by individual children.

Analysis of the field notes enabled the researcher to further deduce information providing an initial inventory or list of observed configuration of semantic features related to prepositions. Analysis of field notes determined broad categories of semantic features that were demonstrated by the participants and gave a preliminary benchmark of semantic features used to prepositions by children age 4 to 5 years showing TLD. This enabled the initial mapping of semantic features being used by the children showing TLD age 4 to 5 years in the prototype. A review of the record of observations and field notes are in the form a written summary in the findings.

3.4.1.5 Revision of data collection protocol for prototype. Subsequent to the prototype being conducted changes were made to the way the protocol was presented to children. A full appraisal of the findings from the prototype and the protocol trial in Stage 1 are discussed in the findings chapter.

On completion of Stage 1, after a full review and reflection of the findings and presentation of the initial protocol, changes were made to the prototype. The most significant changes were made to the way the protocol prompts were presented. Syntactic bootstrapping is a method of learning new vocabulary where syntactic cues are used as an aid in creating lexical mapping (Rice, Cleave, & Oetting, 2000). Children generally comprehend the syntactic function and use it to determine or label objects

using novel words (Jolly & Plunkett, 2008: Newman & German, 2002). Bootstrapping could have been used by the children to determine location, direction or movement. The researcher was aware of this prior to conducting the prototype and had thought that it had been eliminated by stripping the prompts back to minimal instructions. Following the initial prototype and trial of the protocol it was felt that children, through syntactic deduction, may still have been able to make inferences. This study aimed to find out what children knew about features of prepositions and children could possibly have used bootstrapping as a strategy to deduct information previously not known.   In the prototype participants were given prompts which gave explicit instructions to use a target object (toy mouse) when demonstrating their understanding of the prepositions e.g. "Make the mouse go 'around' something" or "Put the mouse 'under' something" or "Put the mouse 'next to' something". Language used by the researcher in the prototype when giving prompts could have suggested to children that they were always required to select another object from those provided and use it in some way. In the case of the prompt that included the preposition 'next to' this could have allowed for random placement of objects. Therefore the children could have been selecting another object due to the wording in the prompt resulting in them randomly placing the given object (toy mouse) and another object provided 'next to' each other purely due to knowing that two objects need to be used and that they need to provide the researcher with a demonstration. Bootstrapping could also have been used for example when children were prompted by the researcher saying "Can you make the mouse go 'around' something?" Reference to 'something' may have suggested to a participant who did not have a firm understanding of the features related to the preposition 'around' that the inclusion of the word 'go 'tended to suggest an action orientated response rather than static placement of the mouse. In addition, static placement rather than movement could have been suggested by using the word 'put' in some prompts e.g. "Put the mouse 'next to' something".

Individual objects available to use in conjunction with the target object (toy mouse) were not named in the protocol prompts. This was in order not to influence participant's decision in making selections about whether to select objects to use in their demonstrations or indeed which object or objects to choose. This meant that all the

objects provided on the table in front of participants were collectively referred to as 'something'. While this did encourage children to make their own selection of objects to use in demonstrations the wording used in the protocol prompts could have influenced children in deciding how many other objects to use. As a result of the way the protocol prompts were worded it was determined that children in the prototype of this study could have been demonstrating an understanding that words without this suffix refer a singular form and consequently to single entities. Jean Berko (1958) conducted a well-known experiment into how children use endings to create new words. The 'wug test' using images of a 'wug' or bird like animal carried out by Berko was an experiment to investigate the acquisition of the plural and other inflectional morphemes in English speaking children. Children in Berko's study were told "This is a wug" when presented with an image of one wug. Another wug was revealed, and the children were then prompted in the 'wug test' by the researcher saying, "Now there are two of them. There are two...?" Even very young children in Berko's study (76 % of 4 to 5 year olds were able to deduce the correct –s ending compared to 97 % of 5 to 7 year olds) could apply the general rule in English language that adds the suffix –s (Berko, 1958).

Protocol prompts in Stage 2 of this study were consequently stripped of any supporting words. This meant that each of the prompts used in the main study contained just one preposition word e.g. 'under', 'over'. As a result the changes to the protocol prompts which were subsequently used in the main study did not include any opportunities for the participants to use bootstrapping or plurality. The researcher had also previously named and given the target object for children to use in demonstrating their understanding, which was always the toy mouse. All protocol prompts for use in the main study were reduced to the researcher stating one preposition word. This meant that in response to the prompts participants were consequently able to make their own choices when selecting any of the objects either as the target object or other objects to demonstrate acquisition of prepositions.

A prompt to elicit demonstrations related to the preposition 'across' was added to the protocol. This allowed the prospect of a horizontal path or movement aspect being added to demonstrations of semantic features was potentially included rather than just including the prepositions 'through' (vertical plane/path) and 'around' (circular/path).

In adding the prompt 'across' to the main study prepositions it extended the opportunities for participants to demonstrate features of preposition acquisition related to directional words and movement.

The small hoop originally included in the initial prototype was replaced with a larger circular hoop (inner diameter of 12 centimetres, the outer diameter was 16 centimetres, giving the hoop a 2 centimetre rim that was 1 centimetre deep). The children age 4 to 5 years showing TLD in the initial prototype who selected the small circular cookie cutter to demonstrate features in response to the prompts seemed to find it difficult to push the target object (mouse) through the cookie cutter due to its small diameter. As all objects provided need to be usable if selected a larger hoop diameter essentially provided the same opportunities for use but was deemed easier for children to manipulate.

Before beginning sessions in the initial prototype the small Lego door that was part of the collection of objects available to the children was always presented as open when placed on the table for children to use. The Lego door was removed from the objects children could select to use in demonstration for a number of reasons. Observations suggested that there was the possibility that the few children engaging in imaginative play, could have been encouraged to simply push the toy mouse through the door while playing or using play scripts in response to the prompt "Make the mouse go through something" rather than actual demonstration of the features of the preposition 'through'. Also some children responded to the prompt "Put the mouse in something" by saying "Look the mouse is going in the house" [4 yrs 3 mths 2 dys. Participant 2. Protoype] then pushing the mouse through the Lego doorway. It was felt that an opportunity existed for children to rely on known phrases or scripts rather than demonstrating features or actual acquisition of the preposition 'through'. This led to some doubt surrounding the validity or authenticity of the demonstration of the preposition 'through' by those participants in the prototype who responded to the prompt 'through' by pushing the mouse through the door. The plastic Lego door (Plastic frame with hinged door) and the two pieces of Duplo originally provided may have had semantic connections for the children as construction items. Some children were compelled to build structures with

these objects causing them to become unfocused. The Duplo blocks were also removed and replaced with two plain wooden blocks (2.5 cm x 2.5 cm x 5 cm).

The Lego door was a fronted object (obvious front or face) and was the object generally selected by the children to demonstrate features related to the prepositions 'in front' and 'behind'. The toy mouse was also a fronted object and initially seen as a motivator for the children. While the toy did engage children in demonstrating prepositions some participants were distracted by imaginative play which may have interfered with them staying focused on demonstrating features of the prepositions. The toy mouse was removed from the objects available for participants to use in main study demonstrations. The researcher wanted to fully explore features associated with the prepositions 'in front of' and 'behind'. Non-featured or non-fronted objects are more likely to be interpreted in either an egocentric way or in relation to a referent therefore providing more opportunities for participants to display features (Cox, 1979). The container provided for use in the prototype had a clear embossed label on it which could have suggested that it was the front of the container so this was replaced with another tub the same size with no identifiable marking. The objects used in the main study were; a circular hoop (inner diameter of 12 centimetres, the outer diameter was 16 centimetres, giving the hoop a 2 centimetre rim that was 1 centimetre deep), plastic circular container (height 8cm, 10.5 cm in diameter), a matching lid (11 cm diameter, 1.5 cm depth), 2 wooden blocks (2.5 cm x 2.5 cm x 5 cm) (Appendix D).

Revision to the prototype or trial included developing a simple checklist for the researcher to use privately to record observations if the child independently and spontaneously displayed any features or actions related to individual preposition in response to the prompts in the protocol. This involved making notes or recording configurations of objects in the appropriate section on the recording sheet next to the preposition prompt if the child responded and moved any of the objects in any way in a positive and determined fashion. The recording table was kept out of view from the participants and assisted the researcher in keeping track of which prompts had been asked, recording configurations immediately and allowed the researcher to focus on the participant actions.

3.4.1.6 Finalised prepositions used in main study. The prepositions used in main study were; 'in', 'on', 'under', 'over', 'behind', 'next to', 'between', 'through', 'around' and 'across'. The final protocol including these prepositions was administered to all children in Stage 2 of the main study (Appendix E).

3.4.2 Stage 2: Data Collection and Feature Identification (Children showing Typical Language Development and Children with Specific Language Impairment)

3.4.2.1 Selection of the participants showing Typical Language Development in the main study. Research Questions #1and #2 relate to identifying semantic features used by children with SLI and children showing TLD. One hundred and six children aged four years to six years of age showing TLD were included in the main study (Table 3.2). Data collected from individual activities conducted with these 106 children aimed to investigate Research Question #1.

The findings from the children age 4 to 6 years showing TLD also allowed data to be collected and analysed to investigate Research Question #3. Rather than suggesting a firm cut off point the neurolinguistic hypothesis of a critical or sensitive period suggests that a decline in ability or plasticity for language acquisition occurs (Clancy & Finlay, 2001; Hurford, 1991). The cohort for the children showing TLD in the main study included an age span (4 to 6 years) that aimed to determine if there was a 'fixing' of semantic features to lexical items that suggest an 'adult –like' understanding of the prepositions.

Table 3.2.

Participant Sample in the Main study of Children Showing Typical Language Development

Participant Information	Main Study Children Showing TLD Age 4 to 5 years	Main Study Children Showing TLD Age 5 to 6 years
Number of participants	60	46
Male	32	18
Female	28	28
Research Site	A mainstream school Perth Metropolitan area	A mainstream school Perth Metropolitan area

Table 3.3.
Children Aged Four Years to Five Years Showing Typical Language Development Included in the Main Study

| Number of participants | Age | | Male | Female |
	Years	Months		
6	4	0	2	4
3	4	1	2	1
6	4	2	6	0
3	4	3	2	1
3	4	4	2	1
7	4	5	3	4
6	4	6	2	4
4	4	7	2	2
6	4	8	3	3
4	4	9	1	3
5	4	10	3	2
7	4	11	4	3

This part of the study was conducted before collecting data from the children with SLI in the main study. The researcher also wanted to ensure than in selecting the age of the participants of the children in Stage 2 with SLI to be included in the main study that these children would demonstrate the widest variety of semantic features related to the target list of prepositions. By collecting data from a broad age range it was anticipated that the age of children with SLI to be included in the study could be more appropriately selected.

The 106 children aged 4 to 6 years who were participants in the main study showed TLD and did not have an identified language impairment. Male and female children age 4 to 5 years ranged across the whole year span (Table 3.3). Male and female children age 5 to 6 years also ranged across the whole year span (Table 3.4). All 106 participants only spoke English and came from English speaking educational backgrounds. The children aged four years to six years showing TLD all attended a mainstream school. Parental/carer permission was also gained from a further seven children aged between 4 to 6 years to be included in the study but these children declined when they were asked to participate in the actual demonstrations.

3.4.2.2 Research sites (Participants showing Typical Language Development).
The research school in the main study was purposefully selected and was a mainstream
school environment in the Perth Metropolitan area. The classes in these schools have 20
children in the kindergarten (age approximately 4 to 5 years) and approximately 26 to 28
children in the preprimary classes (age approximately 5 to 6 years). Each class has one
full time class teacher/educator and at least one fulltime education assistant.

**3.4.2.3 Data collection for the participants showing Typical Language
Development in the main study.** The final protocol was administered in the main study
to children age 4 to 5 years showing TLD and children age 5 to 6 years with TLD. The
researcher visited all classrooms prior to conducting the main study sessions, spending
time working or playing with the children. As in the protocol trial, data from children
who attended the sessions but treated the sessions as a game and just played or used the
materials for construction, showed signs of incomprehension or refusal to complete tasks
was not used in the analysis.

Table 3.4.

Children Aged Five Years to Six Years Showing Typical Language Development Included in the Main Study

| Number of participants | Age | | Male | Female |
	Years	Months		
4	5	0	2	2
6	5	1	3	3
4	5	2	1	3
3	5	3	1	2
10	5	4	5	5
4	5	5	1	3
3	5	6	1	2
3	5	7	0	3
4	5	8	2	2
3	5	9	0	3
1	5	10	1	0
1	5	11	1	0

Occasionally the researcher asked participants if they had finished if children appeared to place or move objects then continue to move and place objects or they simply manipulated any of the objects for an extended amount of time in a repetitive or random fashion. This data was not included in the analysis. Data collected during the main study sessions included the observations of the presence or absence of features demonstrated by the child participants, namely the children age 4 to 5 years showing TLD and the children age 5 to 6 years with TLD were recorded following each prompt or preposition word. The components developed from those features displayed by participants were deemed to be typical components extracted from typical representation of each preposition prompt. When using using Semantic Feature Analysis (SFA) or componential analysis to analyse features it enables unambiguous grouping dependant on features observed rather than reliance on our own personal interpretation (Goodenough, 1967).

Observations were recorded immediately as opposed to mental notes which aimed to increase the accuracy of the data collected (Glesne & Peshkin, 1992). This method of data collection complimented Research Questions #1 and the data collection of the child participants showing TLD which aimed to examine those semantic configured features related to prepositions by the children in uninterrupted spontaneous movement or placement of objects. During data collection the child participants showing TLD in the main study were able to demonstrate their understanding of prepositions by way of configuring features. The researcher was directly able to discern ongoing behaviour as it occurred and make notes about its salient features (Cohen & Manion, 1992). Observations can also be used to support or challenge beliefs or comments made by participants (Kervin, Vialle, Herrington & Okely, 2006). Observations were analysed using SFA to give features of understanding related to prepositions rather than an overview of linier development. The approach included quantifying the qualitative data by determining the presence or absence of a theme in a sample which gave an insight to the acquisition of features acquired by children in relation to their understanding of prepositions. Categories or the key features were derived from the actual placement of the objects by participants as observed by the researcher. Each category or features was described as a word or phrase sufficiently close to that which is has been observed. The

researcher was aware of unconscious bias and constantly endeavoured to maintain objectivity when recording actions (Cohen, Manion & Morrison, 2007). Data was collected and gave the researcher the findings to analyse and allowed inferences to be made related to semantic features configured by children in their understandings related to prepositions. Descriptive statistics are used to present the findings.

Children age 4 years to 6 years showing TLD were included in the main study. Including participants from a wide age range was designed to determine if at some point in acquisition of these preposition words there was a 'fixing' of semantic features to lexical items that suggest an 'adult –like' understanding of the prepositions. The researcher also wanted to ensure that in selecting the age of the participants of the children with SLI to be included in the study that the children with SLI would demonstrate the widest variety of semantic features related to the target list of prepositions included in the protocol prompts. Collecting and analysing the data from children age 4 years to 6 years showing TLD showed that the most useful data was found in children age 5 to 6 so the decision was made not to include younger children with SLI age 4 to 5 years in the main study.

Semantic Feature Analysis (SFA) or componential analysis was used to analyse the findings.

3.4.2.4 Selection of the children with Specific Language Impairment in the main study. The researcher collected data from twenty five children (18 males and 5 females) with SLI who attended a language development centre (LDC) in Perth. In order to meet the requirements to attend this school the children are diagnosed using standardised assessments as meeting the criteria for diagnosis with SLI. While the underpinning philosophy of integration and inclusion for children with disabilities is apparent in the school system of Western Australia, the state has retained a system of special schools and classes for children with SLI.The centres provide intensive early intervention programs for students in Kindergarten to Year 2 diagnosed with SLI. When students exit the centres they are transitioned back to their enrolled school among their mainstream peers. There is an LDC based in each Perth metropolitan district as well as a LDC in the Peel district.

In order to gather as much information as possible related to features of prepositions it was felt that after conducting the first parts of Stage 2 of the study where the protocol was administered to children age 4 to 6 years showing TLD that as more features were identified in the 5 to 6 age range it would be more beneficial to just administer the protocol to children with Specific Language Impairment age 5 to 6 years.

The gender distribution for children with SLI attending a LDC in Western Australia consists of more boys than girls, approximately 3:1 ratio. The gender balance of participants in the main study reflects this. All participants only spoke English and came from English speaking educational backgrounds.

3.4.2.5 Research sites (Children with Specific Language Impairment). The research school was purposefully selected. The research sites were segregated classroom settings at a variety of different sites at the LDC in the Perth metropolitan area where all the students in each class had been identified as having a SLI. Research sites are all within the same school district suggesting a similar mix of cultural and socioeconomic background for the children with SLI as the TLD cohort. The classes have a maximum of 12 children (age approximately 5 to 6 years), one class teacher and a part-time education assistance.

3.4.2.6 Data collection for children with Specific Language Impairment in the main study. To investigate Research Question #2 the participants in Stage 2 of the study were children aged 5 to 6 years with SLI. The final protocol was administered in Stage 2 of the study to children with SLI. The researcher visited all classrooms prior to conducting the sessions, spending time working or playing with the children. As with the children showing TLD who were also participants in the study data from children who attended the sessions but treated the sessions as a game and just played or used the materials for construction, showed signs of incomprehension or refusal to complete tasks was not used in the analysis. Occasionally the researcher asked participants if they had finished if children appeared to place or move objects then continue to move and place objects or they simply manipulated any of the objects for an extended amount of time in a repetitive or random fashion. This data was not included in the analysis.

Data collected included the observations of the presence or absence of features demonstrated by the child participants, namely the children with SLI, were recorded

following each prompt or preposition word. Observations were recorded immediately as opposed to mental notes which aim to increase the accuracy of the data collected (Glesne & Peshkin, 1992). This method of data collection complimented Research Question #2 and the data collection of the child participants with SLI for the main study which aimed to examine those semantic configured features related to prepositions by the children in uninterrupted spontaneous movement or placement of objects. Categories or the key features are the actual placement of the objects by participants as observed by the researcher. Each category or features is described as a word sufficiently close to that which is has been observed. Observations were analysed using semantic feature analysis to give features of understanding related to features of prepositions. Descriptive statistics are used to present the results. This data was then able to be mapped onto the data collected from children showing TLD and then examined in relation to Research Question #3. Descriptive statistics are used to present the results.

3.4.3 Stage 3: Data Collection and Establishing of Norms (Adults)

3.4.3.1 Development of the Adult Instrument. Research Question #4 relates to determining any pedagogical implications which arise from the degree of fit between the semantic features used by children with SLI and children showing TLD. The findings from participants in Stage 2, children with SLI and children showing TLD were mapped onto the norm-referenced adult usage. In order to determine 'adult' understanding and configuration of semantic features related to prepositions an Adult Instrument consisting of a set of visual images was developed. This was developed following the data collection and identification of emergent features from children age 4 to 5 years showing TLD and children age 5 to 6 years showing TLD and the children with SLI age 5 to 6 years in Stage 2.

Development of the Adult Instrument aimed to determine those semantic features presumed to be socially accepted adult 'norms' which are modeled to children during socio-cultural interactions as children develop an understanding of prepositions. A category or concept can be defined by the best possible example or an example that contains significant elements of the category or concept with meaning contained within the lexical unit (Lund & Duchan, 1993). Prototypes that have features that are typical

are captured and used when making judgments about the typicality of a concept (Aarts & McMahon, 2006). A methodical approach was taken to designing the visual images for viewing and ascertaining adult understanding of prepositions.

A self administered Power Point slide show was developed as the trial Adult Instrument. The trial Adult Instrument aimed to further explore the emergent features from the data collected from Stage 2 involving children age 4 to 5 years showing TLD, children age 5 to 6 years showing TLD and children with SLI age 5 to 6 years. Many different semantic features related to prepositions that had been identified in the child data were included in the images. The collection of Power Point slides in the first Adult Instrument trial contained one title slide containing instructions to participants and 53 images designed to explore adult understandings of the semantic features related to the target prepositions; 'in', 'on', 'under',' over', 'behind', 'next to', 'between', 'through', 'around' and 'across' (Appendix F). These images were computer generated shapes positioned to elicit a variety of responses from participants. Slides were placed in random order and many individual images in the slides allowed exploration of a number of prepositions and their semantic features depending how participants chose to respond. Some recognisable everyday objects were also included in some images such as a photographic image of a table, a glass tumbler and a high backed chair.

3.4.3.2 Recruitment for the trial Adult Instrument. Four different trials of the Adult Instrument were conducted. The four trials conducted involved 1 to 5 participants in each trial. A total of 15 adult participants (8 males and 7 females ranging in age from 18 to 52) were included in the four trials. Participants were recruited using the 'snowballing technique' (also known as Chain Referral Sampling. A method of recruiting participants through word of mouth). Participants self administered the trial instrument by viewing the images in the PowerPoint slides and writing a response. The trial Adult Instrument and the response sheet was distributed either by hand or by electronic circulation (email) and responses were received either by hand, by post or by electronic reply
(Appendix G).

3.4.3.3 Adult Instrument trials. The trials of the Adult Instrument enabled data to be collected in the form of written responses directly related to viewing individual

images. Informal interviews were conducted with some trial adult participants following completion of viewing the Adult Instrument.

Coding was used to sort the written data collected. Coding is a strategy where data is segmented into common or related themes or the act of breaking apart the data or those actions that are observed (Cohen et al., 2007; Wiersma & Jurs, 2005). Data was collected and codes were derived from the data. Movement of codes or modifications to codes were necessary requiring the researcher to examine the data many times. By coding the data the researcher was able to detect frequencies and patterns which occurred. Initial data in the form of written responses was read and reread as to become familiar and for the researcher to note features (Hammersley & Atkinson, 1983). Codes are derived from the data itself rather than being created prior to observations or data collection (Hammersley & Atkinson, 1983). Each image required a written response related to the position location or movement of objects seen in the image. The first preposition that was used in each written response was coded as the primary preposition for that description. Other language used by participants was also extracted and grouped as patterns emerged. When evidence conflicted, deeper probing of the differences was undertaken to identify the cause or source of conflict. From the data semantic features related to the prepositions 'in', 'on', 'under',' over', 'behind', 'next to', 'between', 'through', 'around' and 'across' were able to be identified.

3.4.2.4 Amendments of Adult Instrument. The trialing of the Adult Instrument greatly assisted in eliminating ambiguity with comprehension of the requirements of the tasks and with achieving clarity of the tasks and the presentation of the final images. The trials also gave an insight into the nature of responses that might be expected. Subsequent to comments and responses from participants following each of the trials adaptations were made which led to the fine tuning of the trial Adult Instrument culminating in the final Adult Instrument (Appendix H). The response sheet was also modified to correspond with the images in the final Adult Instrument (Appendix I).

A description of the changes made to the Adult Instrument subsequent to the trials follows:

a. There was a heavy reliance by some adults in the Adult Instrument trials to describe the position of objects or direction using 'left' and 'right' which detracted from

them using preposition words in their written responses. The first slide of the Adult Instrument PowerPoint contained instructions of how to respond to the images and asked participants to only describe the object location, position or movement of objects. Despite these instructions several adults in the Adult Instrument trials described the functional capabilities of the objects, omitted to use prepositions and did not describe the location, position or movement of the objects. Instructions to avoid the functional capabilities of the objects being the sole response needed to be explicitly included in the first instruction slide instructions of the final Adult Instrument. Consequently the wording used in the first instruction slide in the Adult Instrument was changed. The first PowerPoint slide in the Adult Instrument trial slide show giving instructions to participants had previously read: 'Complete the sentence to identify the direction, position or location of the named object'.

More sentences were added over the trials to clarify instructions so the final collection of visual images in the Adult Instrument contained a modified first slide giving instructions that stated:

'What words would you use to describe the position or movement of the named objects? Please do not describe the function of the objects or what you think the object is capable of doing, just the actual position or location as seen in relation to the other objects. You can use as many words as you feel is necessary. Please do not use 'left' or 'right', or use compass reference points. If you do not feel that there is an immediate or clear relationship to the other objects please write 'pass' '".

This made the instruction clearer, more explicit and gained more responses from the participants that contained preposition words.

b. Changes were made to the colours of the shapes used in the images. The images included in this thesis are seen in black hues. In the presentation to participants colours had been assigned to particular shapes and objects used in the images. The colours of the shapes used in the trial images were changed to using a variety of colours for shapes in the final Adult Instrument. This aimed to eliminate any retention of position from previous images while viewing the images as a collection in one sitting. The colours of shapes included in the final Adult Instrument images were randomly assigned. This

aimed to eliminate any mental imagery retention of the positioning of shapes from one image to another. Using different colours for the shapes was also deemed necessary to avoid confusion when participants responded. When responses were examined the colours listed in the responses therefore identified shapes and made it easier to code the data. This was especially important when participants responded and gave multiple lists of prepositions to describe shapes, objects and configurations seen in the images.

c. Changes and adaptations were made to individual images in the Adult Instrument. Following the trials bases were added to some of the trial images to give perceptual depth and make the images clearer. Bases consisted of a computer generated pale yellow coloured parallelogram with pale gray borders. Different colour bases were trialed and eventually the ones chosen were deemed to enhance definition of the shapes or objects whilst not detracting from the purpose of describing their position. Bases were positioned under the shapes or objects used in the image filling approximately fifty percent of the viewing screen. Only those images where bases assisted with perspective were changed. This was determined from feedback from trial participants. Where it was not necessary or judged to complicate the image bases were not added.

d. Images were also numbered in the notes section of each PowerPoint slide in the final Adult Instrument. In the trial Adult Instrument if the participant came away from the slide show there was no way to know which question they were up to as animated slides needed to be effectively viewed twice to see the movement of objects. This confusion occurred in one of the trials observed by the researcher and it became apparent that if participants were expected to conduct the task of viewing the images alone while writing responses the images needed to be able to be easily followed or easily resumed if the participant ceased viewing the images for whatever reason.

Images in the final Adult Instrument were changed to being numbered in the bottom left corner of each slide so if participants 'lost their place' they were easily able to relocate the response number on the response sheet. Where animation was added to slides the notes section of the slide gave two consecutive numbers to correspond with the participant clicking on the first slide then the second click providing the animation e.g. Number 2 and then number 3. The response sheet was also changed to include a

response section pertaining to the static positioning of the image previous to the participants clicking again and seeing the image animated.

    e. The images related to the preposition 'in' were designed to explore adult understanding of centrality, containment and contact. The original trial Adult Instrument related to the preposition 'in' included images of a glass tumbler with a circular shape at the bottom positioned in various places, suspended halfway down inside the drinking glass, just above the rim of the drinking glass and out of the drinking glass (Figure 3.6). The glass tumbler had originally been used as a vessel but the photograph of the drinking glass did not provide a clear notion of containment. There was some difficulty in the first trials with adult participants perceiving the circular shape as being inside the image of the drinking glass so the images examining 'in' featuring a glass were changed to a computer generated opaque square sided vessel which was also placed on a base (Figure 3.6). The number of images related to exploring the preposition 'in' were reduced in the final Adult Instrument as redundant data was being gathered from the image of the circular shape outside the glass which was continually being described by some Adult Trial participants as "edge of the screen", "fallen out" "by itself". Image 53 of the trial Adult Instrument was therefore removed. Image 20 (Figure 3.5) of the trial Adult Instrument was refined and adapted (Figure 3.6. Image 55) and the final Adult Instrument also included an image to examine centrality without complete immersion of the object (Figure 3.7. Image 20)

Table 3.5.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Features of the Preposition 'in'

Features of preposition 'in'	Trial Adult Instrument Images	Final Adult Instrument Images
Centrality	20	8, 55
Containment	8, 41, 43, 47, 53	46, 82
Contact	20, 47	8, 31, 35

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.

Trial Image 8   Trial Image 20   Trial Image 41   Trial Image 43

Trial Image 47   Trial Image 53
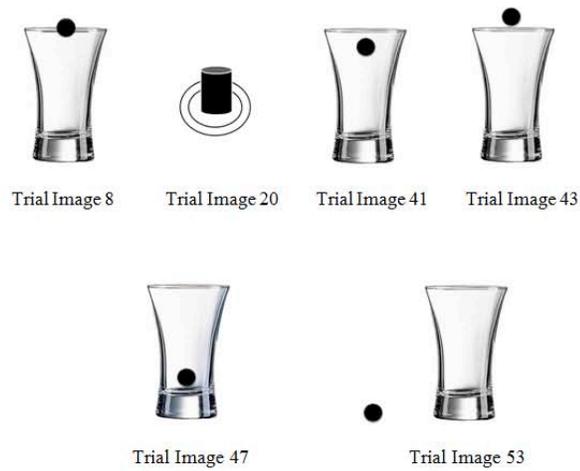
Figure 3.6. Images in the trial Adult Instrument related to features of the preposition 'in'.

Image 8   Image 31   Image 35

Image 46   Image 55   Image 82
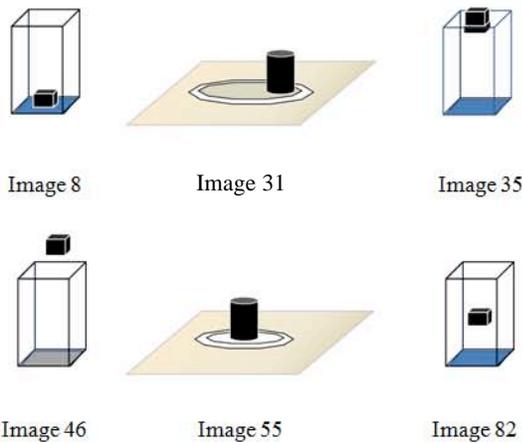
Figure 3.7. Images in the final Adult Instrument related to features of the preposition 'in'.

f. There were three images designed to explore the feature of centrality and contact related to the preposition 'on' (Figure 3.8). There were no changes made to the image content used in the trial Adult Instrument or the final Adult Instrument. Changes were made to the order they were in viewed (Table 3.6). An image of a table was used rather than just using inanimate shapes to focus the viewer on the centre of a known object.

Table 3.6.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Features of the Preposition 'On'

Features of preposition 'on'	Trial Adult Instrument Images	Final Adult Instrument Images
Centrality	27, 32, 39	10, 21, 45
Contact	27, 32, 39	10, 21,45

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.

This relied on the prior knowledge the viewer brought to the task or what they knew and understood about the function of a table. One image showed the whole underside face of the shape in direct contact with the table and was centrally placed. One image showed the shape on the edge of the table to explore the notion of centrality being a feature of the preposition 'on'. One image aimed to explore if complete contact with the table had to be made or if the shape was described as 'on' even when only some of the underside face of the shape in was in direct contact with the table.

g. In the trial Adult Instrument shapes were placed in a variety of configurations in the images to elicit responses related to the prepositions 'in front', 'behind' and 'next to' (Table 3.7). Precedence of prepositions was examined by placing shapes in particular positions to see if adults chose one preposition over another or ordered descriptions by describing a particular preposition before another. It was hoped that it might assist in understanding which features are more prominent or necessary related to these prepositions.

All images in the instrument could potentially be described by participants using a variety of prepositions and different ordering of relationships between prepositions within certain images aimed to explore or provide opportunities for participants to show particular precedence for one preposition feature rather than another. Following examination of the data collected in the trials of the Adult Instrument the original set of images in the trial did not address this aspect fully with many slides eliciting no response from trial partcipants e.g. trial images 11, 29, 51 (Figure 3.9). The final Adult Instrument included more combinations of the typical configurations of 'in front', 'behind' and 'next to' seen in child demonstrations in the main study (Figure 3.10).

Figure 3.8. Images related to features of the preposition 'on' in the Trial Adult Instrument Images and Final Adult Instrument.

Table 3.7.

Trial Adult Instrument Images and Final Adult Instrument Images Related To Features of the Preposition 'In Front', 'Behind' and 'Next to'

Features of preposition 'in front', 'behind' and 'next to''	Trial Adult Instrument Images	Final Adult Instrument Images
Precedence or order of listing prepositions 'in front', 'behind' and 'next to''	4, 11, 18, 22, 29, 51	4, 14, 33, 34, 40, 49, 51, 53, 56, 58, 72, 75
'In front', 'behind' 'next to' – 360 degree placements around another shape	3, 17, 19, 21, 23, 24, 26, 35	9, 17, 20, 25, 52, 54, 61, 63, 65, 67, 73, 79
'Next to' – contact and distance from another shape	17, 52	1, 29, 32, 37, 41, 44
'Next to' - centrally adjacent 90 degree angle	17, 52	1, 29, 32, 37, 41, 44

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.

Trial Image 4   Trial Image 11   Trial Image 18

Trial Image 22   Trial Image 29   Trial Image 51
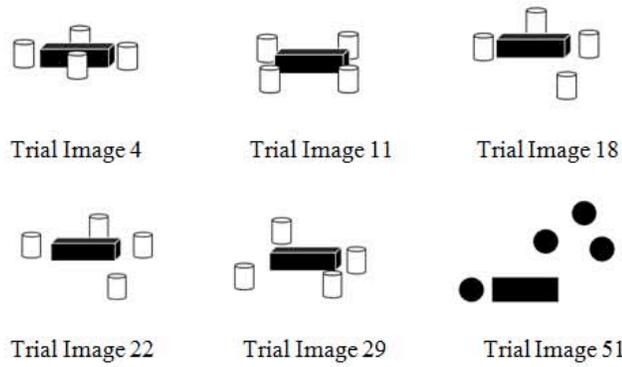
Figure 3.9. Images in the trial Adult Instrument related to precedence or order of listing prepositions 'in front', 'behind' and 'next to'.

Image 4   Image 14   Image 33

Image 34   Image 40   Image 49

Image 51   Image 53   Image 58

Image 72   Image 75
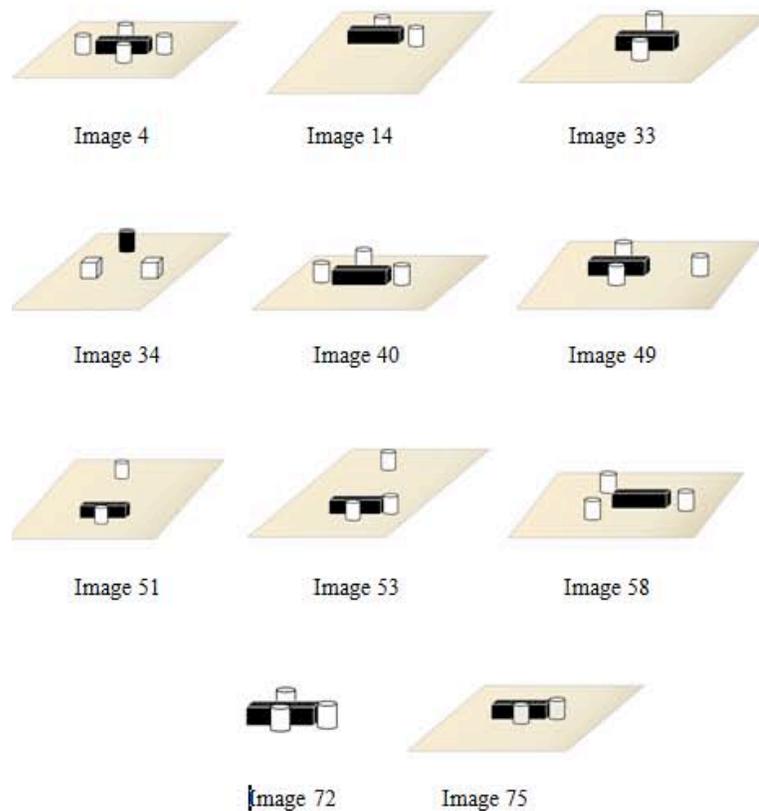
Figure 3.10. Images in the final Adult Instrument related to precedence or order of listing prepositions 'in front', 'behind' and 'next to'.

h. The preposition 'next to' is related to proximity positions. The trial collection of images contained images devoted to gaining more understanding related to the features of the preposition 'next to' (Figure 3.11). To further examine adult understandings of typical configurations and the characteristic placement of objects as 'next to' a set of slides was designed so objects were placed forwards and backwards of the horizontal

plane of another shape. Essentially this was designed to examine where in relation to an object being configured with another the preposition 'next to' was assigned.

The data from the four trials did not really serve to discriminate between the assignment of the features related to the prepositions 'next to', 'behind' and 'in front'. Subsequent to examining the data from the trials it was decided by the researcher to extend this notion of where in relation to an object being configured with another the preposition 'next to' was assigned to include the prepositions 'in front' and 'behind'. This was to determine where in the configurations of objects the assignment of preposition words used by participants in their responses changed from 'next to' to 'behind' to 'in front'. In order to explore the features associated with these prepositions additional images were added to the final Adult Instrument to provide a fine degree of differentiation between 'next to', 'behind' and 'in front' by placing one object at intervals around the perimeter (covering 360 degrees) of another object (Figure 3.12).

In the trial Adult Instrument these images directly related to the features of the preposition 'next to' also examined how close one object needs to be to another and if a centrally adjacent 90 degree angle was required to be assigned the preposition. Just two of these images were devoted to examining if the features of distance between two shapes on a horizontal plane and if contact or the amount of distance affected the ability of the participant to describe the two shapes as being 'next to' each other (Figure 3.13). These slides were modified in the final Adult Instrument and more images were added to further examine distance between two objects when describing them as 'next to' and if a centrally adjacent 90 degree angle placement was required in order for participants to assign the preposition (Figure 3.14).
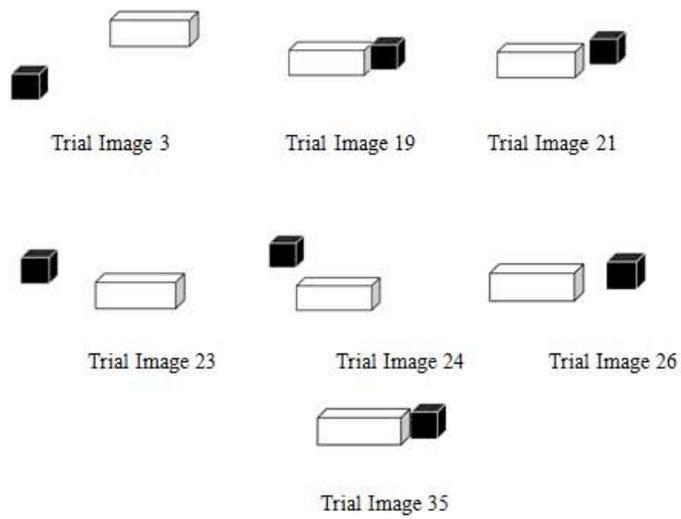
Figure 3.11. Images in the trial Adult Instrument related to 'in front', 'behind' 'next to' 360 degree placements of one shape around another shape.
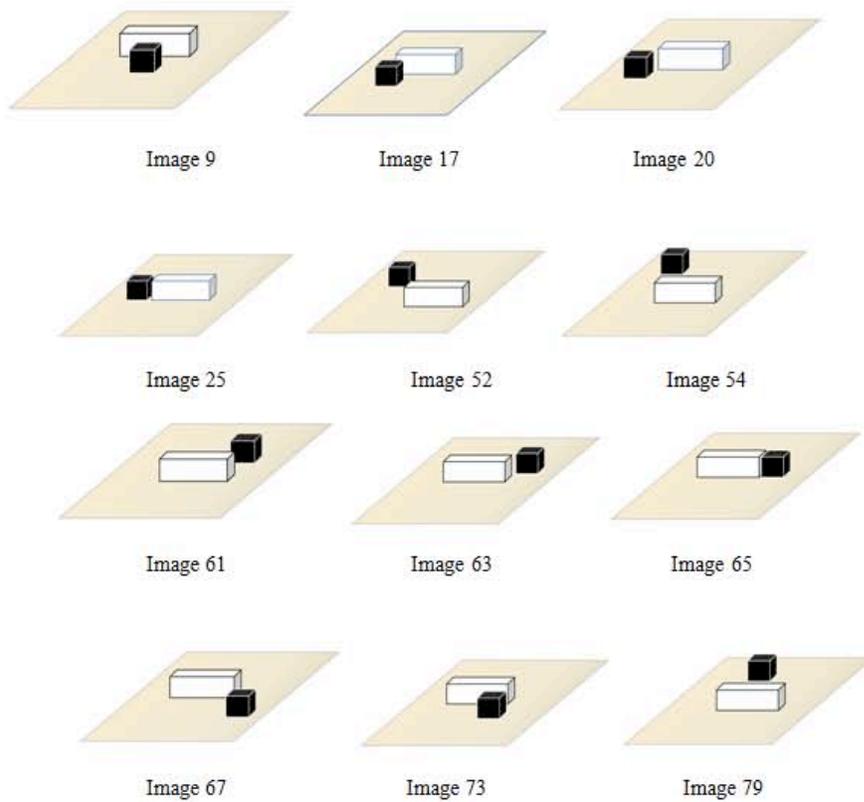
Figure 3.12. Images in the Adult Instrument related to in front', 'behind' 'next to' 360 degree placements of one shape around another shape.

Trial Image 17   Trial Image 52
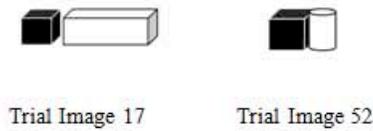
Figure 3.13. Images in the trial Adult Instrument related to the preposition 'next to', contact and the distance from another shape, centrality and an adjacent 90 degree angle.

Image 1   Image 29   Image 32

Image 37   Image 41   Image 44
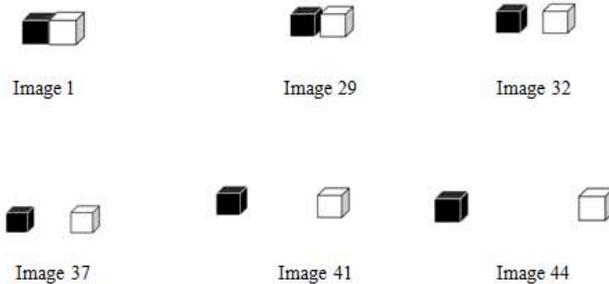
Figure 3.14. Images in the final Adult Instrument related to the preposition 'next to', contact and the distance from another shape, centrality and an adjacent 90 degree angle.

i. Images in the trial Adult Instrument were designed to examine the features related to the preposition 'behind' and 'in front' (Table 3.8). Images were also included to determine if participants used thier knowledge of a front or back of a known object to describe the position of another shape in relation to it. To determine if fronting of an object affected the description or the preposition used an image of a chair together with an inanimate shape was used in the trial Adult Instrument (Figure 3.15). Although children were not provided with fronted objects or objects with obvious fronts or faces in the main study, providing fronted objects to adults allowed this aspect to be investigated. The same images were also included in the final Adult Instrument.

Shapes with no obvious fronts or faces or non-fronted objects positioned on a projective plane were included to specifically determine which objects the participants deemed to be 'in front' or 'behind' were included in the trial Adult Instrument (Figure 3.16). Two other images were also included in the final Adult Instrument to further clarify this (Figure 3.17).

Table 3.8.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Fronting Features of the Preposition 'In front' and Behind'

Fronted and non fronted objects	Trial Adult Instrument Images	Final Adult Instrument Images
Fronted object	9, 49	39, 68
Non fronted object configured on a 180 degree projective plane	46, 48	9, 19, 43, 79

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.
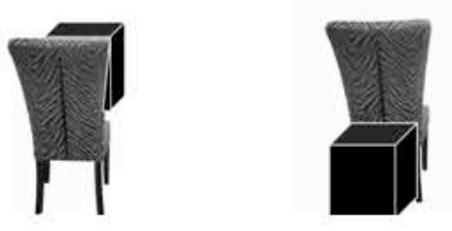
Figure 3.15. Images in the trial Adult instrument and the final Adult Instrument related to the prepositions 'In front' and 'Behind' showing fronted objects.
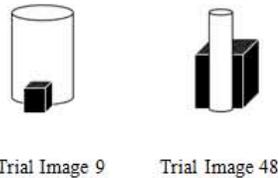
Trial Image 9   Trial Image 48

Figure 3.16. Images in the trial Adult instrument and the final Adult Instrument related to the prepositions 'In front' and 'Behind' showing non fronted object configured on a 180 degree projective plane.
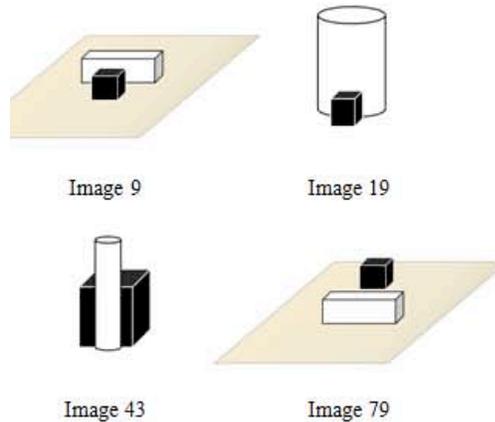
Figure 3.17. Images in the final Adult instrument and the final Adult Instrument related to the prepositions 'In front' and 'Behind' showing non fronted object configured on a 180 degree projective plane.

j. In the trial Adult Instrument 'under' was explored using images of a shape that was completely 'covered and in contact' with another object (Figure 3.18). One of these images [Image 7] was eliminated from the final Adult Instrument and a base was added to the other image. Other images were included in the trial Adult Instument of the shape in partial contact and therefore parially covered by another object (Figure 3.19). A familiar object, the table, that is understood to have a canopy/cover was included to examine if the preposition 'under' applied when the shape was not in contact with a covering object (Figure 3. 20). Images of a shape not in contact with the object above and varying degrees of covering were included in the trial Adult Instrument. Some images examined how far away from the object above another can be from the object below and still be assigned the preposition 'under' (Figure 3.21). Collectively these images were designed to discover adult understandings of features related to 'under' included contact and complete covering of the whole object by another object or how much of an object needed to be covered to deem the object 'under' another object. In the final Adult Instrument all of these features and concepts were retained together with all of the images except trial Adult Instrument image 7 was deleted and Adult Instrument image 74 was added (Table 3.9). In the final Adult Instrument some images were refined by including bases (Figure 3.22).

Table 3.9.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Features of the Preposition 'Under'

Features of preposition 'under'	Trial Adult Instrument Images	Final Adult Instrument Images
Contact with and complete covering	7, 10	66, 74
Contact with partial covering	12, 15	18, 42
Non contact and complete covering	34, 45	7 , 36
Distance	3, 28, 40	22, 26, 30

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.
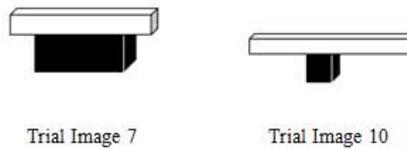
Figure 3.18. Images in the trial Adult instrument related to the preposition 'under' showing one object in contact with another object and complete covering.
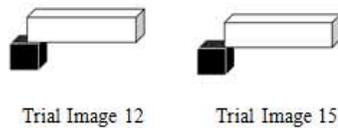
Figure 3 19. Images in the trial Adult instrument related to the preposition 'under' showing one object in contact with another object and partial covering.

Trial Image 34   Trial Image 45

Figure 3.20. Images in the trial Adult instrument related to the preposition 'under' showing one object, non contact and complete covering.

Trial Image 3   Trial Image 28   Trial Image 40

Figure 3.21. Images in the trial Adult instrument related to the preposition 'under' investigating distance.

k. In the trial Adult Instrument 'over' was explored using images of a shape that was vertically positioned directly above one other object (Figure 3.23). The notion of contact was included by including slides where the object vertically above was in direct contact with the upper face of the object below (Figure 3.24). Path was explored by including a slide where one object moved vertically and on a horizontal plane up and over another static object (Figure 3.25). The final Adult Instrument images related to the prepositon 'under' (Figure 3.26) saw one image (trial Adult Instrument image 33) related to static contact of one object on another elliminated as no expansion on the original trial data was achieved between the original two trial Adult Instrument images originally provided related to this concept (trial Adult Instrument images 1 and 33). The use of the glass tumbler had been eliminated from other images in the final Adult Instrument therefore the image using a glass (trial Adult Instrument image 43) was

adapted utilising a computer generated vessel (final Adult Instrument 46) . Table 3.10. shows the trial Adult Instrument Images and final Adult Instrument images related to features of the preposition 'over'.
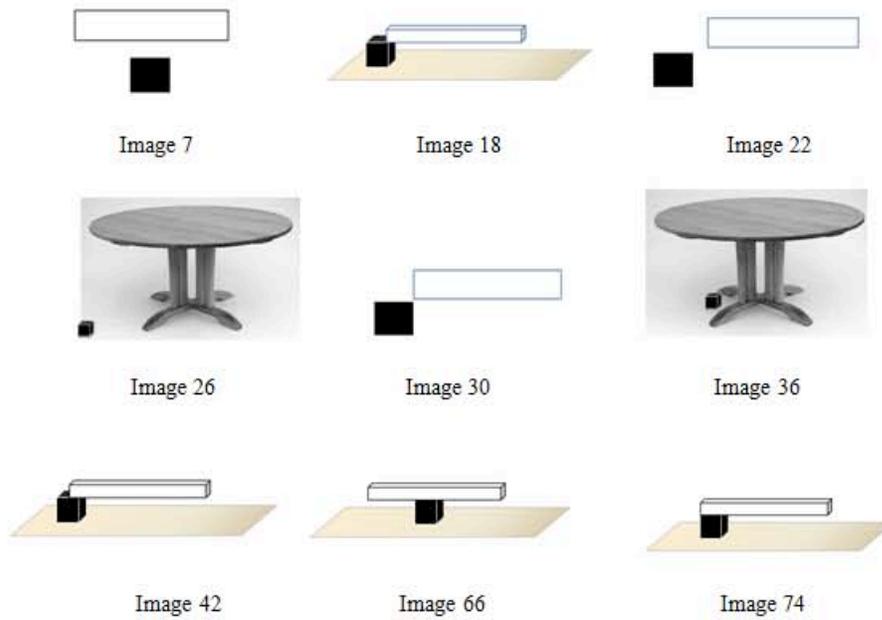
Figure 3.22. Images in the final Adult instrument related to the preposition 'under' showing one object in contact with another object and complete covering, contact with partial covering, non contact and complete covering and distance.

Table 3.10.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Features of the Preposition 'Over'

Features of preposition 'over'	Trial Adult Instrument Images	Final Adult Instrument Images
Static position directly vertical to one other object	1, 43	5, 46,
Static position in contact across the top face of one other object	14, 33	50
Vertical movement from one side of a static object to the other side	5	71

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.

Trial Image 1   Trial Image 43
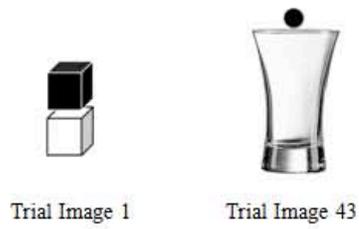
Figure 3.23. Images in the trial Adult instrument related to the preposition 'over' showing the static positioning of one object directly vertical to one other object.

Trial Image 1   Trial Image 33

Figure 3.24. Images in the trial Adult instrument related to the preposition 'over' showings one object in contact across the top face of one other object.

Trial Image 5
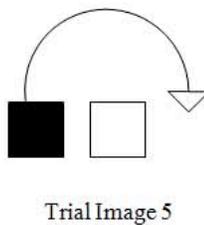
Figure 3.25. Images in the trial Adult instrument related to the preposition 'over' showing vertical movement from one side of a static object to the other side (animated image showing object to the left of screen moving vertically from one side of the central object to the other side).
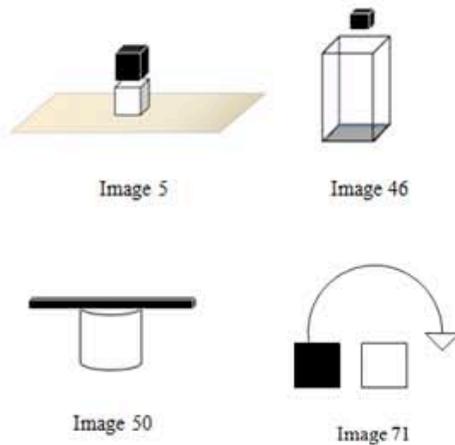
Figure 3.26. Images in the final Adult instrument related to the preposition 'over'.

l. Images were created to examine if the shape needed to be horizontally adjacent to other shapes to be deemed 'between' and also if another shape affected the description of the target shape being 'between' others (Table 3.11). In the trial Adult Instrument an image containing movement of the target shape was also included to determine if movement was a feature and if the preposition 'between' was used by participants (Figure 3.27). The final Adult Instrument images included many more configurations to further explore the sematic features related to the preposition 'between' (Figure 3.28). Some of these images examined the distance required among three objects in order for participants to assign the preposition 'between'. One other animated image was also added. This image [77] showed movement of one object toward two static objects but full movement past the objects is not seen.

Table 3.11.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Features of the Preposition 'Between'

Features of preposition 'between'	Trial Adult Instrument Images	Final Adult Instrument Images
Horizontal placement of three objects	2, 6, 36, 37, 38	3, 6, 13, 33, 38, 49, 58, 62, 69, 77

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.

Trial Image 2: 'Between'   Trial Image 6: 'Between'   Trial Image 31: Animated
                                                        image 'Between'
                                                        (Shape passes the other 2
                                                        shapes to the other side).

Trial Image 36: 'Between'   Trial Image 37: 'Between'   Trial Image 38: 'Between'
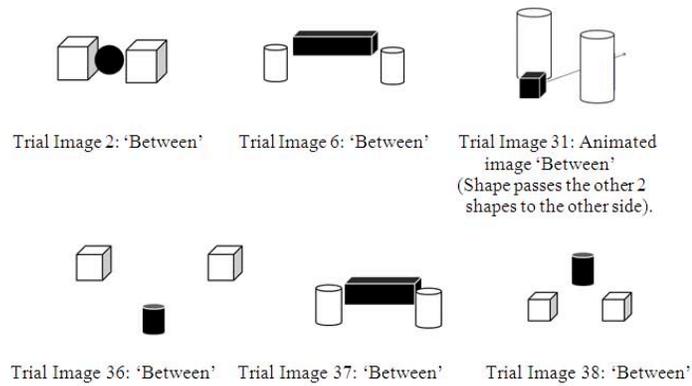
Figure 3.27. Images in the trial Adult instrument related to the preposition 'between'

Image 3: Animated image.   Image 6: 'Between'
(Shape passes the other 2 shapes).
'Between'

Image 13: 'Between'   Image 33: 'Between'

Image 38: 'Between'   Image 49: 'Between

Image 58: 'Between'   Image 62: 'Between'

Image 69: 'Between'   Image 77: Animated image.
                                             (Shape does not pass the other 2 shapes).
                                             'Between'
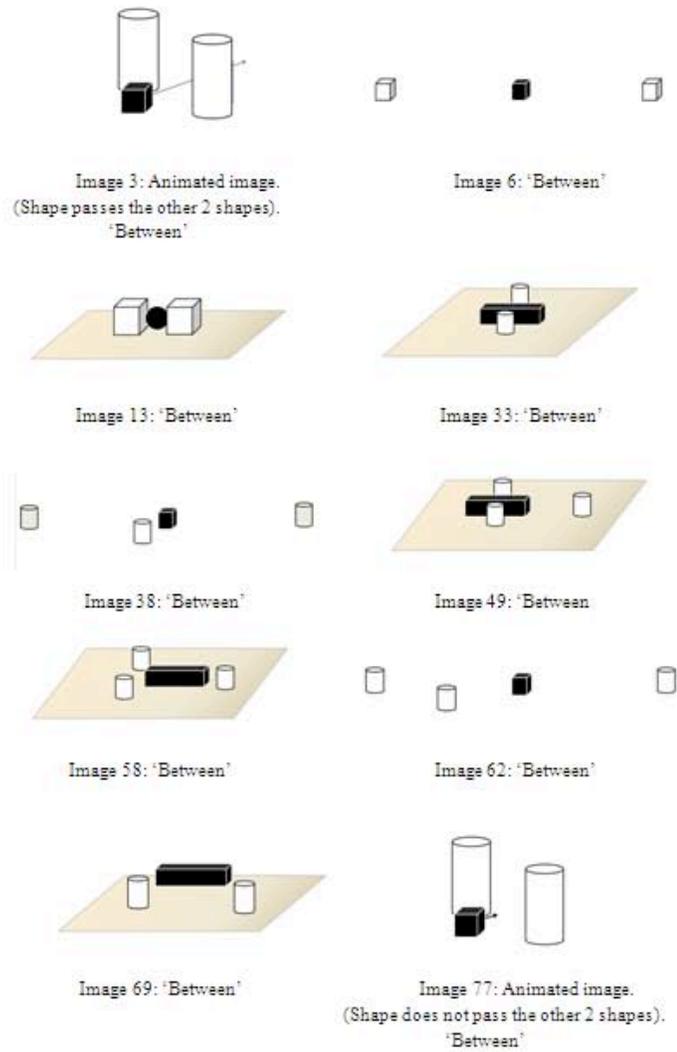
Figure 3.28. Images in the final Adult instrument related to the preposition 'between'.

m. A selection of images were created to examine movement and containment related to features of the preposition 'through' (Table 3.12). The preposition 'through' was targeted in the trial Adult Instrument images by moving one shape 'through' another shape that completely encased or surrounded the other. The need for complete surrounding of all four faces of the moving objects as a feature was explored by providing trial Adult Instrument image 31. Movement past or through two other shapes which encased the other on two sides and where the moving shape stopped before it moved past or 'between' the two shapes on either side was shown in the final Adult Instrument images (Figure 3.29). One extra image was added to the final Adult Instrument (Figure 3.30). This final image aimed to see if the feature of movement of a particular shape was needed and if the object needed to go completely past those that surrounded it or if the movement of a shape could be deemed as 'through' if it moved towards others.

Table 3.12.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Features of the Preposition 'Through'

Features of preposition 'through'	Trial Adult Instrument Images	Final Adult Instrument Images
Animated movement of one object from one side to the other of a boundary	16, 31	3, 28, 77

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.


Trial Image 16: Animated image 'Through' (Object moves from one side through the boundary/hoop to the other side).

Trial Image 31: Animated image 'Through' (Object moves from one side through the boundary/blocks to the other side).
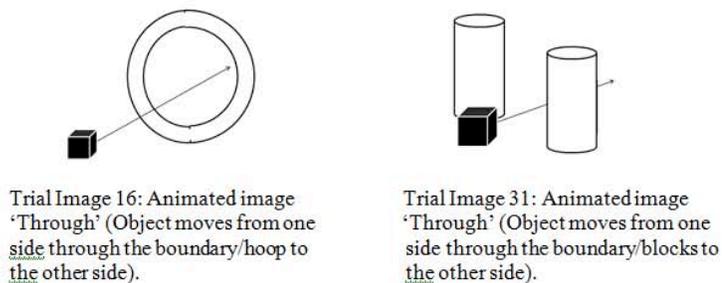
Figure 3.29. Images in the trial Adult instrument related to the preposition 'through'.
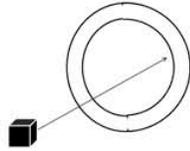
Trial Image 16: Animated image 'Through' (Object moves from one side through the boundary/hoop to the other side).
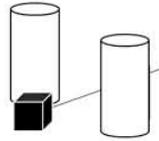
Trial Image 31: Animated image 'Through' (Object moves from one side through the boundary/blocks to the other side).
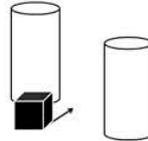
Image 77: Animated image 'Through' (Object moves from one side of the boundary/blocks and stops in the centre of the two outer objects).

Figure 3.30. Images in the final Adult instrument related to the preposition 'through'.

n. A selection of images were devoted to examining movement identified in the demonstrations made by children in the main study related to the preposition 'around' (Table 3.13). The image showing movement in the trial Adult Instrument originally used a circle that circumnavigated 360 degrees around the square shape (See Figure 3.31). This shape was changed in the final Adult Instrument from using a circle to a triangle were made to remove language similarities and connections to a 'round' shape (the preposition 'around') (Figure 3.32). Another two images were also added that moved less than 360 degrees, one slide showed an object moving 270 degrees to the left and one slide showed an object moving 270 degrees to the right and did not fully circumnavigate the other shape. This aimed to examine if a full curcumnavigation was necessay to consitute the preposition 'around' being assigned. To examine if movement was a necessary feature of the preposition 'around' a selection of shapes placed continuously around the edge of another in a circular pattern was included.

Table 3.13.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Features of the Preposition 'Around'

Features of preposition 'around'	Trial Adult Instrument Images	Final Adult Instrument Images
360 degree circumnavigation of another object	50	12
Less than 360 degree circumnavigation of another object	-	16, 60
Static placement of objects 360 degrees around another	25	78

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.

o. The images related to the features of movement and contact associated with the preposition 'across' were included in the trial Adult Instrument and the final Adult Instrument (Table 3.14). One image showed an object moving from left to right of the screen and one image included a base. The same images were provided in both the trial Adult Instrument and the final Adult Instrument (Figure 3.33).

Trial Image 25: 'Around'   Trial Image 50: 'Around' (Animated image 270 degree movement from left to right)
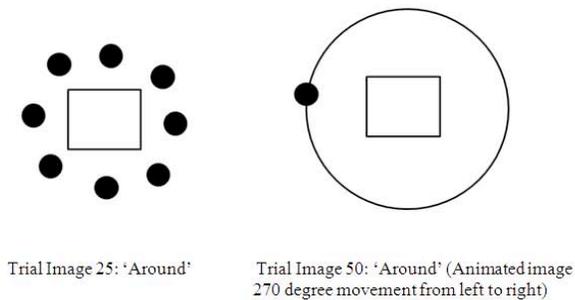
Figure 3.31. Images in the trial Adult instrument related to the preposition 'around'.

Image 12: 'Around' (Animated image 360 degree movement from left to right)

Image 16: 'Around' (Animated image 270 degree movement from left to right)

Image 60: 'Around' (Animated image 270 degree movement from right to left)

Image 78: 'Around'
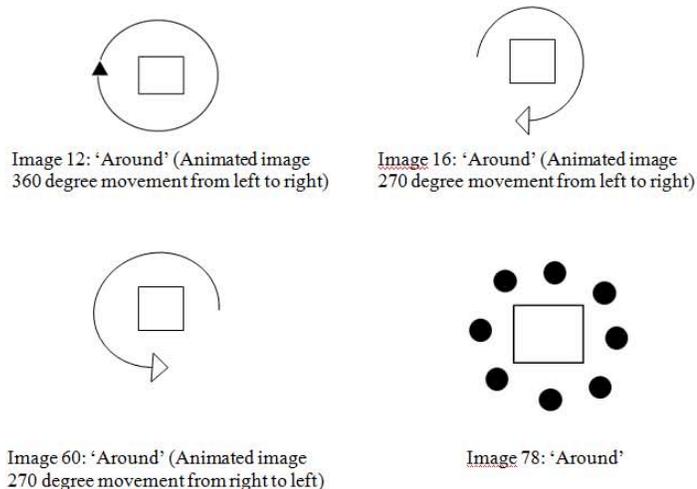
Figure 3.32. Images in the final Adult instrument related to the preposition 'around'.

3.4.3.5 Final amendment of Adult Instrument. The four trials allowed the final Adult Instrument (Power Point slide show containing animated and static images) to be gradually developed. The final Adult Instrument contained one title slide containing instructions and 84 images.

Table 3.14.

Trial Adult Instrument Images and Final Adult Instrument Images Related to Features of the Preposition 'Across'

Features of preposition 'across'	Trial Adult Instrument Images	Final Adult Instrument Images
Animated movement of one object from left to right from one side to the screen to the other	3, 42	24, 81

Note. Some images were retained and used in both the trial Adult Instrument and the final Adult Instrument. Image numbers do not necessarily correspond across each instrument as some images were added and deleted and compilation of images was different in each instrument.


Figure 3.33. Animated Images in the trial Adult instrument and the final Adult Instrument related to the preposition 'across' showing movement from left to right of the screen with and without providing a base.

3.4.3.6 Recruitment of adults for Adult Instrument. The final Adult Instrument was completed by 32 adult participants who were recruited to complete the final Adult Instrument using the 'Snowballing technique' (Cohen et al., 2007). This allowed the participant sample to be from the general public, target different age groups and different socioeconomic backgrounds. Table 3.15 shows the distribution of age and gender of the adult participants. An incentive program was offered to all participants. Participants who wished to be included in the incentive were included by placing contact details in a draw for a gift card to the value $50. The gift card was presented to one participant who had completed and returned the written responses to the visual tasks. This served to maximize the response rate (Cohen et al., 2007). The final Adult Instrument and the response sheet was distributed either by hand or by electronic circulation (email) and responses were received either by hand, by post or by electronic reply.

Table 3.15.

Age and Gender Distribution of the Adult Sample Recruited for the Final Adult Instrument

Age	Male	Female
18 - 24	2	5
25 - 34	2	0
35 - 44	6	4
45 - 54	5	4
55 - 64	0	3
Over 65	1	0

3.4.3.7 Data collection of Adult Instrument. The data from the final Adult Instrument addressed Research Question #4 by way of demonstrating the language that adults use in everyday life that children are subsequently exposed to. Data was collected and features related to prepositions were derived from the data. The first preposition that was used in each written response was coded as the primary preposition for that description. Other language used by the trial participants was also extracted and grouped as patterns emerged. Chapter four presents descriptive statistics and discussion of the data collected from the prototype trial in Stage 1, the data collected from the main

study in Stage 2, the data collected from the participants in the Adult Trial in Stage 3 together with the mapping and comparison of features of children showing TLD and children with SLI and features of adult norms which was Stage 4 of the study.

3.5 Validity and Reliability

Validity includes the extent that the findings are accurate and representative of what is being researched (Best & Kahn, 2003). Reliability refers to the extent that the research can be replicated and the degree that findings and conclusions can be generalised (Wiersma & Jurs, 2005). Verification techniques supporting the credibility and trustworthiness of the findings in the study were:

- Thick case descriptions – descriptions of observations were sufficiently rich in detail that others are able to extract their own conclusions from the data being presented (Leedy & Ormrod, 2005).

- Feedback from others – the researcher sought the opinions of colleagues and the study supervisor to determine if the researcher had made appropriate interpretations and drawn valid conclusions from the data (Leedy & Ormrod, 2005) (Anonymity of participants was maintained at all times).

- Member checks - selective adult responses were then provided to the participants for them to validate the accuracy and completeness of the representation. The researcher also took her conclusions back to the participants to ascertain that the conclusions reached were conducive to the participants' experiences (Cohen & Manion, 1992; Fraenkel & Wallen, 2003).

- Triangulation - data were derived from a variety of sources. When triangulation is utilised multiple sources of information converge to enhance and support the credibility, meaningfulness and accuracy of the results (Leedy & Ormrod, 2005).

3.6 Ethical Issues

Ethics clearance was obtained from Curtin University Human Research Ethics Committee (HREC) to meet National Health and Medical Research Council (NHMRC) requirements for research of this kind.

Confidentiality is an essential component of conducting any type of research (Fraenkel & Wallen, 2003). All participants were initially provided with an information sheet. Written informed consent was obtained from all those people nominated to participate. Participants' identities and privacy were protected and all respondents remained anonymous. All responses and details of participants were coded and only known to the researcher. Personal information of participants was stored separately from any data collected and no records, observations or data contained the participants' names, addresses or any other identifiable information. Participants were encouraged to participate in the research, however continual participation in the study depended on each individual. It was made explicit that the researcher respected the right of all participants to retain the right to withdraw from the study at any time without any penalty or prejudice and without offering reason or justification for their decision (Fraenkel & Wallen, 2003).

The researcher was aware that permission must also be sought from child participants and credible and meaningful explanations of the research was given to minors (Cohen et al., 2007). The researcher obtained written informed consent from those adults responsible for the prospective students, namely parents, principals and teachers. Children were given real and legitimate opportunities to refuse participation in the research. Data, digital video and images derived from conducting and recording assessment tasks will be held securely and erased prior to destruction after a minimum of 5 years to avoid voice identification and preserve anonymity subsequent to the examination of the thesis. All participants were made aware that they were able to withdraw contributions at any time without penalty. Any child recruited from the mainstream school or that was identified by the researcher as having possible difficulties learning language, subsequent to discussion with caregivers/parents and teachers was referred to a speech pathologist for further testing. No psychological or physical harm was incurred by any persons due to participating in this research.

3.7 Limitations of the Study

This study had the following limitations. Due to only one researcher, a degree of researcher bias that could impact on the research exists. While this bias cannot be completely avoided, it can be minimised by the researcher demonstrating an awareness

of the bias (Cohen & Manion, 1992). Observer expectation is when the researchers know they are observing participants with certain characteristics and then may expect a certain type of behaviour. The use of video recordings of observations assisted in guarding against selective observations. During observations no pressure was placed on participants to complete the responses quickly as this may lead to inaccurate findings. The protocol for collecting observation data was structured and explicit ensuring each participant was exposed to the same procedure. The researcher critically contemplated the findings and reported the results after careful reflection. As previously stated, peer review or discussion of interpretations and conclusions with other people challenged the researcher to provide solid evidence for interpretations and conclusions.

The data collection was from a limited number of adults and a limited number of children in segregated LDCs and mainstream classrooms situated in Perth, Western Australia. The research was carefully planned to include children showing TLD age 4 to 6 years and children with SLI age 5 to 6 years. Therefore the findings may not be able to be generalised to children outside these ages. However, there is transferability of the study procedures and research method. The uniqueness of the individuals studied may not be a true representation of the wider population. Consequently, based on this study alone generalisation of the findings cannot be assured. The study focused on a specific list of prepositions and therefore the findings may not be able to be generalised across the full spectrum of prepositions. The ability to draw descriptive or inferential conclusions from the sample data about a larger group is also limited.

In order to conduct the study children with identified Specific Language Impairment were sought. It would be extremely difficult, but not impossible to 'find' children who fit the criteria for SLI but who have not yet been identified or who have been identified but have not received any 'intervention'. The study did not seek to measure curriculum delivery related to prepositions but sought to identify features associated with prepositions. It is acknowledged that therapy for children with SLI in specialised language development centres may have targeted preposition vocabulary but may not have targeted the specific features associated with these words. Therefore comprehension or features associated with prepositions may be enhanced.

CHAPTER 4
Findings

To reiterate, the data collected in this study aimed to examine how semantic features are configured by children showing Typical Language Development (TLD) and children diagnosed with Specific Language Impairment (SLI) in their understanding of prepositions. The findings from the data gave an insight into the features the children demonstrated using objects when prompted with a preposition word. The study was conducted in four stages. This chapter presents descriptive statistics together with a written analysis of the data collected from the prototype trial in Stage 1, the children showing TLD and the children with SLI in the main study in Stage 2 and the participants who completed the Adult Instrument in Stage 3. Data was also collected in Stage 4 to assist in gaining an overview of adult understandings related to prepositions. This enabled the researcher to evaluate and determine the semantic features perpetuated in socio-cultural contexts, namely within a western culture in Australia. This chapter culminates by giving an overview of Stage 4 by contrasting and comparing the semantic features demonstrated by children showing TLD, children with SLI and adult norms.

4.1 The Initial Prototype

4.1.1 Data Collected From the Initial Prototype

Data collected from children age 4 to 5 years showing TLD in Stage 1 who participated in the prototype was in the form of observations and field notes. This data greatly increased the awareness in the researcher of the configuration objects and of features related to the target preposition words. Many of these features were able to be examined in the main study in Stage 2.

4.1.1.1 Identified features. The data from Stage 1 were collated and analysed to provide a preliminary benchmark of semantic features used by children age 4 to 5 years showing TLD. Analysis consisted of identifying features observed during the demonstrations related to each preposition word prompt as listed in the protocol. This provided an initial inventory of semantic features related to preposition understanding in children age 4 to 5 years showing TLD.

The following features were observed in response to preposition prompts during the prototype:

- In – containment (of object selected), contact (between objects selected)
- On – centrality (object placed centrally in relation to other objects) , contact (between objects selected)
- Over - static placement and movement (of objects selected)
- Behind/in front - opposite projective placement, objects having a designated front and back used as a reference (fronting)
- Under – centrality (objects placed centrally in relation to other objects)
- Next to – contact (between objects selected)
- Between - contact (between objects selected)
- Through – movement (of objects selected)
- Around - static placement and movement (of objects selected)

4.2 Data from the Main Study

The analysis of the data from Stage 2 of this study gave an overview of the context-free interpretations by children of their understanding of the semantic features of each target preposition word. This section will provide a list of the semantic features identified from analysing the responses to the preposition prompts from children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and the children age 5 to 6 years with SLI.

The following is an outline of the presentation of the analysis of data and findings from Stage 2 included in this section. The data analysis for each of the following target prepositions 'in', 'on', 'under', 'over', 'around', 'across' between', 'through', is discussed separately. The preposition prompts for 'behind', ''in front' and 'next to' were administered separately in the protocol but the findings have been examined and jointly discussed. The data and findings related to 'behind' and 'in front' is discussed together followed by a collective discussion of the data related to 'behind', ''in front' and 'next to'.

Analysis of responses to some of the preposition prompts in the protocol administered in Stage 2 showed minimal differences, or no remarkable differences, in the semantic features demonstrated between participants. Therefore, within the sections that discuss the analysis of the features identified in Stage 2 related to the

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target prepositions 'on', 'in', 'under', 'over', 'around', and 'across' the data and findings from all participants has been amalgamated. The features related to these target prepositions demonstrated by the children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years are discussed collectively.

The features identified in the configurations of objects related to the target prepositions 'behind', 'in front', 'next to' and 'between' and 'through' for participants in Stage 2, of the main study required an in depth discussion. Within the sections that discuss the analysis of the data and the semantic features demonstrated by each group of child participants in Stage 2 related to each of these prepositions is examined and considered separately. An overall summary of the analysis of the all the data collected during Stage 2 is then given.

Data collected in Stage 2 was extracted from observations during participant responses following each prompt or preposition word as listed in the protocol. The presence of features demonstrated by the child participants during these responses were labeled as components or semantic representation of the prepositions as expressed through topological relations. The analysis of the findings related to semantic features for each preposition word in the protocol of the main study is presented in this chapter as descriptive data. The semantic features listed in the descriptive data were developed from those features displayed by participants. Therefore the features are deemed to be representative semantic features, extracted from typical representations, by participants in response to each preposition word. Observations were analysed using semantic feature analysis to give features of understanding related to preposition words. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children in Stage 2 when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child in Stage 2 when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

Each component or feature observed is listed in the descriptive data and has been given a label. The label is either described as a word or set of words sufficiently

close to the component or feature which was observed. The following is a comprehensive description of each feature or label listed in the descriptive data:

- **Contact base** - the object selected for placement/target object must have contact between the base or underneath of the selected object (be touching) and a supporting base. (This could be another object or contact with the surface of the table used to support the objects provided).
- **Containment** - a physical border surrounds the object selected for placement/target object. Containment is achieved either by immersion or inclusion. Immersion indicates that the object selected is kept static and immersed by the covering of all faces/sides which may or may not include covering to the top of the object contained. Inclusion is achieved by static placement of an object within the inner boundary of another object; all sides except the top of the selected object are completely or partially covered.
- **Horizontal contact with another object (sides touching)** – one or more faces of the selected object is directly in contact with other objects
- **Centrality** - demonstrated when the object selected is placed, centrally inserted or held in the centre or maintained in a central position of another object or objects either above the object, below the object or adjacent to the object or the centre point of the object is crossed.
- **One other object** – the configuration of features included the object selected and one other object provided or in the immediate surroundings.
- **Two other objects** – the configuration of features included the object selected and two other objects provided or in the immediate surroundings.
- **More than two objects** – the configuration of features included the object selected and more than two other objects provided or in the immediate surroundings.
- **90 degree angle (90 $^{\circ}$ angle)** – the amount of space between the object selected and placed and another object, if measured in degrees is a 90 degree angle as viewed by the participant. This may be either a right configuration or a left configuration.
- **Sided one face of object** – a mirroring, covering or shielding on one face/side/point of the object. Contact may or may not be demonstrated.

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- **Sided one face of object and the base** – a mirroring, covering or shielding on one face/side/point of the object and the base. Partial containment is achieved. Contact may or may not be demonstrated.

- **Sided all faces except one** - a mirroring, covering or shielding on all but one face/side/point of the object. An element of containment is achieved. Contact may or may not be demonstrated.

- **Sided four sides of object** - a mirroring, covering or shielding or partial containment is achieved on all but two faces/sides/points of the object i.e. no covering or shielding from another object to the front/back (top/bottom) of the object. Contact may or may not be demonstrated.

- **Horizontal plane** – Object/s placed in a straight angle going from left to right or right to left. The amount of space the amount of space between the object selected and placed and another object, if measured in degrees is a 180 degree angle as viewed by the participant.

- **Projective plane** – Object/s placed in a straight angle going horizontally from front to back/back to front. The amount of space the amount of space between the object selected and placed and another object, if measured in degrees is a 180 degree angle as viewed by the participant.

- **Vertical plane** – Object/s placed in a straight angle going vertically from bottom to top or top to bottom. The amount of space the amount of space between the object selected and placed and another object, if measured in degrees is a 180 degree angle as viewed by the participant.

- **Movement/path** – movement of the selected object is a feature of the response.

4.2.1 In

All 46 children age 5 to 6 years showing TLD, all 60 children age 4 to 5 years showing TLD and all children with SLI age 5 to 6 years included in Stage 2 of the main study responded to the prompt for 'in'. The features demonstrated by the participants can be seen in Table 4.1. One object was selected by each participant and this object was always contained in some way by another object. All 46 children age 5 to 6 years showing TLD selected an object and placed it into the container. Fifty four of the 60 children age 4 to 5 years showing TLD and 21 of the 25 children

with SLI age 5 to 6 years selected an object and placed it into the container. Six children age 4 to 5 years showing TLD and 4 children with SLI age 5 to 6 years selected an object and placed in centrally within the inner boundary of another object (plastic hoop).

Containment either by immersion or inclusion was a feature demonstrated by all children in Stage 2 of the main study in response to the prompt 'in'. Two objects were always used by the children in each of the groups to configure the features for the preposition 'in'. Objects that were selected and placed in the container or immersed had all sides except the top of the object shielded by the sides of the container. Immersed was achieved by placing the selected object inside the container that had sides higher than the object placed within it. Contact was made between one face of the object placed inside the container and the base of the container. The top of the object was exposed and not covered but the sides of the object were shielded by the sides of the container but not in contact with them.

There was a matching circular lid to the container available but no child from any group of children in the main study chose to put the lid on the container once they had selected and placed the object in it. Inclusion indicates that the children contained the selected object by placing it in a central position within the inner boundary of another object where both objects are supported by and in contact with the table as seen in Figure 4. The object chosen by the children to demonstrate inclusion was a plastic hoop. The hoop had an outer diameter of 14 centimetres and inner diameter of 12 centimetres, giving the hoop a 2 centimetre rim that was 1 centimetre deep.

Centrality was not evident when children placed the object selected in the container. In other words, children did not attempt to centralise the inserted object or re-position the object in the container once it was placed. There was only partial shielding of the sides of the object selected that was placed in the hoop. The object selected was centrally when placed on top of the table supporting the objects used in the demonstrations surrounded by the hoop.

In examining Table 4.1 a difference in features that can be seen is that the children age 5 to 6 years showing TLD did not demonstrate the need for centrality when configuring objects. All children age 5 to 6 inserted one object inside the container. This was also the case for the children age 4 to 5 years showing TLD and the children with SLI age 5 to 6 years who also responded by selecting an object and

placing it in the container. It can be concluded that while the children age 5 to 6 years showing TLD did not centralise objects in response to the prompt 'in' it was apparent that for many children age 4 to 5 years showing TLD and the children with SLI age 5 to 6 years this was a necessary feature. Table 4.2. shows the percentage of responses for each semantic feature to the prompt 'in' in children 5 to 6 Years showing TLD, children 4 to 5 Years Showing TLD and children with SLI 5 to 6 Years old.

Table 4.1.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 To 5 Years showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'In'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	+	+	+
Contact base	+	+	+
Horizontal contact	-	-	-
One other object	+	+	+
Two other objects	-	-	-
More than two objects	-	-	-
Centrality	-	+ / -	+ / -
90 degree angle	-	-	-
Sided one face of object	-	-	-
Sided one face of object & base	-	-	-
Sided two sides of object on opposite faces	-	-	-
Sided four sides of object	-	-	-
Sided all faces except one	+	+	+
Sided all faces	-	-	-
Horizontal plane	-	-	-
Projective plane	-	-	-
Vertical plane	-	-	-
Movement/path	-	-	-

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

Table 4.2.
Responses to the Prompt 'In' in Children 5 to 6 Years Showing Typical Language Development, (n=46) Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language Impairment 5 to 6 Years (n=25)

Configuration of objects	Percentage of responses		
	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
Containment	100%	100%	100%
Contact base	100%	100%	100%
One other object	100%	100%	100%
Sided all faces except one	100%	100%	100%
Centrality	0%	10%	16%
No response	0%	0%	0%

4.2.2 On

Two objects were always included when configuring 'on'. One object selected was used as a base or for supporting the other (Table 4.3). All children in each of the groups of the main study in Stage 2 responded to the prompt 'on' (Table 4.4). Children selected one object and consistently placed it centrally in contact with another object with this object providing support or a base for the object. The object selected for the base was also supported by the surface of the table.

The need for centrality was particularly apparent in demonstrations. The children always selected a smaller object to position on the larger diameter lid which meant that this feature was easily identified regardless of the objects selected (Figure 4.4). Centralisation of the object placed on top of the other, regardless of the object used as a base was demonstrated by children actively positioning and repositioning the object to achieve acceptable placement. Centrality was observed when children selected an object and placed the object in the centre of the plastic lid. Centrality was again evident in those participants who selected the container to use in demonstrations. The container was always presented with the base on the table surface and the opening facing up before each verbal prompt. Participants turned over the container to create a flat base then selected another smaller object and placed it centrally on top. A small number of children over the three groups of

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children in Stage 2 of the main study selected a wooden block and placed it on top of another wooden block. Although the blocks had the same dimensions the need for centrality was apparent as children arranged the block on top until the edges exactly matched those of the wooden block underneath.

No remarkable differences were observed between children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and the children age 5 to 6 years with SLI in response to the prompt 'on'. Similarities were evident in that all participants utilised centrality as a necessary component when configuring objects despite of the objects selected. A feature of 'on' is the ability for the object selected to be clearly shown to be functionally supported by a base. It was interesting to note that rather than just placing the selected object so it was in contact with the table i.e. 'on' the table in front of the children that was supporting the objects they could select, all the children in Stage 2 chose a flat base on which to firmly demonstrate support and contact between the objects selected. Most children selected the thin level lid to show this. Table 4.5. shows the percentage of responses for each semantic feature to the prompt 'on' in children 5 to 6 Years showing TLD, children 4 to 5 Years Showing TLD and children with SLI 5 to 6 Years old.

Table 4.3.

Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 To 5 Years Showing Typical language Development and Children with Specific Language Impairment Age 5 to 6 Years Selection of Objects Used For Support or as a Base for the Object Selected in Response to the Prompt 'On'

Objects selected	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Plastic lid	43	57	21
Base of upturned container	2	2	2
Wooden block	1	1	2

Table 4.4.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 To 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'On'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	-	-	-
Contact base	+	+	+
Horizontal contact	-	-	-
One other object	+	+	+
Two other objects	-	-	-
More than two objects	-	-	-
Centrality	+	+	+
90 degree angle	-	-	-
Sided one face of object	-	-	-
Sided one face of object & base	-	-	-
Sided two sides of object on opposite faces	-	-	-
Sided four sides of object	-	-	-
Sided all faces except one	-	-	-
Sided all faces	-	-	-
Horizontal plane	-	-	-
Projective plane	-	-	-
Vertical plane	-	-	-
Movement/path	-	-	-

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol (+) denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

Table 4.5.
Responses to the Prompt 'On' in Children 5 to 6 Years Showing Typical Language Development, (n=46)
Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language
Impairment 5 to 6 Years (n=25)

Configuration of objects	Percentage of responses		
	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
One other object	100%	100%	100%
Contact base	100%	100%	100%
Centrality	100%	100%	100%
No response	0%	0%	0%

4.2.3 Under

Table 4.6 shows the mapping of semantic features for children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years in response to the prompt 'under'.

Children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years in Stage 2 all responded to the prompt 'under'. Table 4.7 shows the objects selected by children in the main study, Stage 2. The prompt 'under' elicited responses from children in all groups where the configuration of features meant that one object was 'under' another object or an object was covered by another object however we wish to interpret the configurations. For the purposes of continuity information will describe the relationship as one object being under another object in a vertical plane. A small number of children in each group selected and placed one wooden block on top of another identical wooden block. It was felt that centrality was apparent as the children in the main study all arranged and rearranged the block on top until the edges exactly matched those of the block underneath. The children who configured the two objects in this way all verbalised the preposition 'under' and gestured so there was no doubt that the wooden block on the surface of the table and beneath the other wooden block was the object considered 'under' the other. This configuration meant that the opposite faces of the wooden block beneath the other wooden block were in contact with the table on the underside and the other wooden block on the upper side.

Table 4.6.

Mapping of Semantic Features For Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in response to the prompt 'Under'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	+ -	+ -	+ -
Contact Base	+ -	+ -	+ -
Horizontal Contact	-	-	-
One other object	+	+ -	+
Two other objects	-	-	-
More than two objects	-	+ -	-
Centrality	+ -	+ -	+ -
90 degree angle	-	-	-
Sided one face of object	-	-	-
Sided one face of object & base	-	-	-
Sided two sides of object on opposite faces	+ -	+ -	+ -
Sided four sides of object	-	-	-
Sided all faces except one	-	-	-
Sided all faces	+ -	+ -	+ -
Horizontal plane	-	-	-
Projective plane	-	-	-
Vertical Plane	-	-	-
Movement/path	-	-	-

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

Table 4.7.

Objects Configured with the One Object Selected by Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Under'

Objects selected	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Plastic lid	40	41	13
Base of container	2	10	9
Upturned container	1	5	2
Wooden block	1	2	1
Object in the immediate environment	2	1	0
Multiple objects used	0	1	0

Most children from all groups in the main study selected one smaller object and placed it 'under' the lid with the upper face of the object in contact with the base. Other variations using two objects included one object being placed in contact with the container base (open end of the container facing up). This configuration meant that the opposite faces of the object beneath the other object were in contact with the surface of the table and the base of the container or the bottom of the lid. Centrality was demonstrated by children when placing one object on top of another object so the object was in the centre position. Regardless of whether participants selected the lid or the base of the container centralisation was demonstrated by children actively positioning and repositioning the object placed above the other in order to achieve acceptable placement. A few children from each group in the main study selected and placed this smaller object 'under' the upturned container. These participants actively turned over the container and placed the open end over the smaller object. Therefore immersion of the object was achieved by completely covering all aspects of it using the container. This configuration meant that the one face or just the base of the object beneath the other object was in contact with another surface.

There were a small number of children in each of the groups who used either objects in the environment such as selecting and holding an object 'under' the table or selecting an object and covering it with their own hands in response to the prompt 'under'. Centralisation was not a feature of these configurations. These configurations meant that the opposite faces of the object beneath the other object

were not in contact with any other surface but were shielded in some way by another object.

Table 4.7 shows that more than two other objects were used by one child age 4 to 5 years showing TLD in the responses to the prompt 'under'. This child used the two identical wooden blocks and the lid to assemble a bridge like construction and then proceeded to move a hand 'under' the construction using a forwards and backwards motion.

In summary, contact with a base and the upper face (opposite faces) of the selected object was a prominent feature in the responses to the prompt 'under' and this component was observed in almost every configuration of objects by children age 5 to 6 years showing TLD. Balance was required to maintain the plastic lid or the plastic container on the other object (usually a wooden rectangular block lay horizontally or vertically) and this could have been the reason why children persisted in centralising the lid or the container. Hence centrality has been judged to be a component of these configurations but evidence was not totally convincing that centrality was an essential feature of the children's response to the prompt 'under'. Evidently children could have just placed the lid or the container in an unbalanced fashion therefore just providing a cover over the other object but children who configured objects in this way consistently did not do this. There were some children in each of the groups of children in the main study that chose to select an object and place it under the upturned container showing that functionality of the container did not deter from the children using it to fully cover the object underneath. Table 4.8. shows the percentage of responses for each semantic feature to the prompt 'under' in children 5 to 6 Years showing TLD, children 4 to 5 Years Showing TLD and children with SLI 5 to 6 Years old.

Table 4.8.
Responses to the Prompt 'Under' in Children 5 to 6 Years Showing Typical Language Development, (n=46)
Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language
Impairment 5 to 6 Years (n=25)

	Percentage of responses		
Configuration of objects	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
Containment	2.17%	8.33%	8%
Contact base	95.65%	96.66%	100%
One other object	100%	98.33%	100%
Centrality	95.65%	95%	100%
Sided two sides of object on opposite faces	97.82%	91.66%	92%
Sided all faces	2.17%	8.33%	8%
No response	0%	0%	0%

4.2.4 Over

Table 4.9 shows the mapping of semantic features for children 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years response to prompt 'over'. Table 4.10 shows the typical demonstrations by children in Stage 2 in response to the prompt 'over'.

All children 5 to 6 years showing TLD in the main study responded to the prompt 'over'. Sixty three percent of children age 4 to 5 years showing TLD elected to demonstrate their understanding using features of movement and verticity compared with 78% of children age 5 to 6 years showing TLD. Some children showing TLD from both age groups demonstrated static placements of objects configured with one object held directly over other object. Some children made contact between objects by placing one object directly on top of another. There was always central placement of the object if contact was made.

Children with SLI age 5 to 6 years also configured objects by holding one object directly above another object but incidences were lower than the children showing TLD. The responses included 32% of children with SLI age 5 to 6 years demonstrating movement of one object following a vertical path over another object. Other configurations demonstrated by children with SLI age 5 to 6 years using objects including 3 children who selected an object and placed it in the container (this could of course be classified as having moved 'over' the rim of the container

then into the container). The object selected was held above the container then 'dropped' into the container rather than the arching of movement seen in other configurations. Of all the children who responded just one child with SLI age 5 to 6 years selected the container and turned it over before replacing it on the surface of the table.

Table 4.9.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Over'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	-	-	+ -
Contact Base	+ -	+ -	+ -
Horizontal Contact	-	-	+ -
One other object	+	+	+
Two other objects	-	-	-
More than two objects	-	-	-
Centrality	+	+ -	+ -
90 degree angle	-	-	-
Sided one face of object	+ -	+ -	+ -
Sided one face of object & base	-	-	+ -
Sided two sides of object on opposite faces	-	-	-
Sided four sides of object	-	-	-
Sided all faces except one	-	-	-
Sided all faces	-	-	-
Horizontal plane	-	-	+ -
Projective plane	-	-	-
Vertical Plane	+	+	+ -
Movement/path	+ -	+ -	+ -

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

Table 4.10.

Configuration of the One Object Selected by Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Over'

Objects selected	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Movement through a central vertical path over one object	36	38	8
Static positioning directly above one other object	5	4	3
Static positioning directly in contact with one other object	5	8	0
Turned container over	0	0	1
Other	0	0	6
No response	0	10	7

Additional responses to the prompt 'over' by children with SLI age 5 to 6 years are listed collectively as 'other'. These configurations included 2 children with SLI who selected one object and placed it in contact with the table and one other object but not using a 90 degree angle. One child selected the hoop and placed it over another object positioning this object centrally. The focus was on the hoop moving over the other object rendering this configuration distinctly different than in responses to the prompt 'in' children selected objects and placed them in the centre of the hoop. Children with SLI age 5 to 6 years were the only children to configured objects using features seen in response to other prompts e.g. 'in' containment (putting one object inside the container) and 'next to' proximity (contact made with one other object). These configurations amounted to almost a third of the total responses from children with SLI to the prompt 'over'.

All children who responded to the prompt 'over' used two objects in their configurations. The configurations children made showed that size of objects was not relevant when statically holding one object directly above the other. Some children chose to hold smaller objects than the object they had selected to hold directly above it and other children chose larger objects to hold directly above. Complete coverage of the object beneath by the object held or placed 'over' the object on the surface of the table was therefore not necessary. This was also the case when children selected one object to move vertically from one side to the other of another object which was on the surface of the table. Some children from all groups verbalised while selecting and moving objects showing personification of objects e.g.

"Jump over' [5 yrs 5 mths 19 dys. SLI participant 19]. "Like a horse" [5 yrs 1 mths 24 dys. TLD participant 87]. "He's got to jump over" [4 yrs 9 mths 28 dys. TLD Participant 103]. "Jumping over the top" [4 yrs 0 mths 19 dys. TLD participant 76]. Table 4.11. shows the percentage of responses for each semantic feature to the prompt 'over' in children 5 to 6 Years showing TLD, children 4 to 5 Years Showing TLD and children with SLI 5 to 6 Years old.

Table 4 11.
Responses to the Prompt 'Over' in Children 5 to 6 Years Showing Typical Language Development, (n=46) Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language Impairment 5 to 6 Years (n=25)

Configuration of objects	Percentage of responses		
	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
Containment	0%	0%	12%
Contact base	10.86%	13.33%	28%
Centrality	100%	83.33%	56%
One other object	100%	83.33%	72%
Sided one face of object	89.13%	70%	44%
Sided one face of object & base	10.86%	13.33%	28%
Horizontal plane	0%	0%	8%
Vertical Plane	100%	100%	44%
Movement/path	78%	63%	36%
No response	0%	16.66%	28%

4.2.5 Around

Table 4.12 shows the mapping of semantic features for children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years response to the prompt 'around'

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Table 4.12.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Around'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	+ -	+ -	+ -
Contact Base	+ -	+ -	+
Horizontal Contact	-	-	-
One other object	+ -	+ -	+ -
Two other objects	-	-	-
More than two objects	+ -	+ -	+ -
Centrality	+ -	+ -	+ -
90 degree angle	-	-	-
Sided one face of object	-	-	-
Sided one face of object & base	+ -	+ -	+ -
Sided two sides of object on opposite faces	-	-	-
Sided four sides of object	-	-	-
Sided all faces except one	+ -	+ -	+ -
Sided all faces	-	-	-
Horizontal plane	-	-	-
Projective plane	-	-	-
Vertical Plane	-	-	-
Movement/path	+ -	+ -	+ -

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

There were a larger percentage of responses from the children age 5 to 6 years showing TLD to the prompt 'around' compared with other groups of participants although response rates were reduced compared with responses to other preposition prompts. Thirty four children age 5 to 6 years showing TLD, 29 children age 4 to 5 years showing TLD and 15 children with SLI age 5 to 6 years responded to the prompt 'around'. As seen in Table 4.13 most children in each of the groups who did respond selected one object and circumnavigated it 360 degrees around one other static object. Some children circumnavigated the object while maintaining contact with the surface of the table; some children held the object and moved the object in the air slightly above the surface but still surrounding the sides of the central object. There were one or two children from each group who chose to surround one object with lots of other statically placed objects demonstrating a partial containment of the central object selected. "You need more blocks to make it go round" [5 yrs 6 mths 29 dys. TLD participant 27]. A few children from each group selected one object then turned it around and around (spun) in their hands. This showed that for children showing TLD contact with a base was not always a necessary feature of 'around'. One of the children age 4 to 5 years showing TLD selected one object and placed it in the centre of the hoop and then while touching the hoop stated "This bits around this bit" [4 yrs 10 mths 4 dys. TLD participant 99]. One child with SLI also configured objects like this but did not comment. Two children age 5 to 6 years showing TLD identified a single round object e.g. the hoop by pointing to it rather than selecting and configuring objects.

Table 4.13.

Response to the Prompt 'Around' showing demonstrations by Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years

Objects selected	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
360 degree circumnavigate one other object	27	26	13
Surround one object with other objects	2	1	1
Spin one object	3	1	0
Identified a circular object	2	0	0
Placed one object in the centre of the hoop	0	1	1
No response	12	31	10

The children in the Stage 2 main study groups who responded to the prompt 'around' generally chose one object and moved the object rather than make static placements. There was very little difference in the types of configurations made among all children in the main study who responded with most choosing to circumnavigate one object 360 degrees around another. Centrality was demonstrated by children who kept the static object central as they moved the object selected around it. During demonstrations children from all groups in the main study actively tried to maintain the object being circled in a central position and even those few children who surrounded one object with other objects kept the object central to the other objects.

Two children age 5 to 6 years showing TLD identified a round object by pointing to a circular object (plastic hoop) amongst the objects provided. This suggested some confusion with the verbal prompt in the protocol 'around' being interpreted as the word 'round'. Table 4.14. shows the percentage of responses for each semantic feature to the prompt 'around' in children 5 to 6 Years showing TLD, children 4 to 5 Years Showing TLD and children with SLI 5 to 6 Years old.

Table 4.14
Responses to the Prompt 'Around' in Children 5 to 6 Years Showing Typical Language Development, (n=46) Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language Impairment 5 to 6 Years (n=25)

	Percentage of responses		
Configuration of objects	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
Containment	4.34%	3.33%	8%
Contact base	34.78%	25%	36%
Centrality	63.03%	46.66%	60%
One other object	69.56%	46.66%	56%
More than two objects	4.34%	2.17%	4%
Sided one face of object & base	30.43%	43.33%	52%
Sided four sides of object	4.34%	3.33%	8%
Sided all faces except one	4.34%	3.33%	8%
Movement/path	65.21%	45%	52%
No response	28.08%	51.66%	40%

4.2.6 Across

Twenty one children age 5 to 6 years showing TLD, 11 children age 4 to 5 years showing TLD and 10 children with SLI age 5 to 6 years responded to the prompt 'across'. Table 4.15 shows the variety of responses to the prompt 'across' by children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years. The objects selected in response to the prompt 'across' by children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years can be seen in Table 4.16.

Movement of one selected object was demonstrated by children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years. Most children who responded from each of the groups demonstrated the feature of movement of one object along a horizontal plane. Observations showed that children selected one object, raised it vertically upward then quickly moved the object across the table surface through the air from either left to right or right to left then lowered it. There were children across all groups who lifted the object selected and moved it horizontally in the air from either left to right or right to left then lowered it and those who pushed the object selected horizontally from either left to right or right to left along the surface of the table. Thirteen percent of children age 5 to 6 years showing TLD selected one object, lifted it up and moved it horizontally and centrally over another object. This movement was distinctly different to the movement children demonstrated in response to the prompt 'over' where a distinct arc was made when moving from one side of the static object to another. The one child with SLI who configured objects in this way verbalised, "Like going across the bridge" [5 yrs 9 mths 9 dys. SLI participant12].

There were a proportion of children age 5 to 6 years showing TLD and children age 5 to 6 years with SLI who selected two identical objects and constructed a cross [+] symbol. This was achieved by selecting one object [wooden block] and then selecting a second object [wooden block] and placing it on top of the first block to form the symbol for a cross. Younger children age 4 to 5 years showing TLD did not demonstrate this.

Table 4.15.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Across'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	-	-	-
Contact Base	+ / -	+ / -	+ / -
Horizontal Contact	+ / -	-	+ / -
One other object	+ / -	+ / -	+ / -
Two other objects	-	-	-
More than two objects	+ / -	-	-
Centrality	+ / -	+ / -	+ / -
90 degree angle	-	-	+ / -
Sided one face of object	-	-	-
Sided one face of object & base	-	-	+ / -
Sided two sides of object on opposite faces	+ / -	-	+ / -
Sided four sides of object	-	-	-
Sided all faces except one	-	-	-
Sided all faces	-	-	-
Horizontal plane	-	-	-
Projective plane	-	-	+ / -
Vertical plane	-	+ / -	-
Movement/path	+ / -	+ / -	+ / -

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

Table 4.16.

Response to the Prompt 'Across' by Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years

Objects selected	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Horizontal movement across a surface (No contact)	2	0	4
Horizontal movement across a surface (Contact)	4	4	0
Horizontal movement centrally over another object	6	6	1
Lined up objects horizontal plane	1	0	0
Projective movement across a surface (Contact)	0	0	1
Vertical movement centrally over another object	0	1	0
Formed a cross symbol using objects	8	0	3
90 degree angle	0	0	1
No response	25	49	15

Movement of the object selected following a horizontal plane and were the dominate features in demonstrations by children in the main study. Essentially there was very little difference in the types of features demonstrated between any of the groups. There were only a few deviations seen in the responses. One child age 5 to 6 years showing TLD lined all the objects in a horizontal line from left to right along the surface of the table directly in front. One child age 4 to 5 years showing TLD selected an object and made an arc up and over another static object using a projective plane. One child with SLI selected an object and pushed it along the table surface away from them. One child with SLI configured objects by placing in contact with each other using a 90 degree angle as seen by the child participant. Symbolic representation of the symbol [+] was also seen in children age 5 to 6 years with SLI and their age matched peers.

Table 4 17.

Responses to the Prompt 'Across' in Children 5 to 6 Years Showing Typical Language Development, (n=46)
Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language
Impairment 5 to 6 Years (n=25)

	Percentage of responses		
Configuration of objects	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
Contact base	28.26%	6.66%	12%
Horizontal Contact	2.17%	0%	0%
One other object	43.47%	18.33%	44%
More than two objects	2.17%	0%	0%
Centrality	13.04%	10%	4%
90 degree angle	0%	0%	4%
Sided two sides of object on opposite faces	17.39%	10%	20%
Sided one face of object & base	28.26%	6.66%	12%
Projective plane	0%	0%	4%
Vertical plane	0%	1.66%	0%
Movement/path	26.08%	18.33%	24%
No response	54.34%	81.66%	60%

4.2.7 Behind and In Front

Each preposition prompt for 'behind' and 'in front' was administered separately
in the protocol during the main study. The findings and semantic features related to
each preposition are presented individually and then discussed collectively. In
presenting a collective analysis the relationship between semantic features between
the two prepositions can also be examined. An overview of the semantic features
observed in the responses to the prompts 'behind' and 'in front' by participants in the
main study can be seen in Table 4.18.

Table 4.18.

Mapping of Semantic Features for 'Behind' and 'In Front' for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'In Front' and 'Behind'

Component	Children age 5 to 6 years showing TLD response to prompt 'in front'	Children age 4 to 5 years showing TLD response to prompt 'in front'	Children with SLI age 5 to 6 years response to prompt 'in front'	Children age 5 to 6 years showing TLD response to prompt 'behind'	Children age 4 to 5 years showing TLD response to prompt 'behind'	Children with SLI age 5 to 6 years response to prompt 'behind'
Containment	-	-	-	-	-	-
Contact Base	+	+	+	+	+	+
Horizontal Contact	+ -	+ -	+ -	+ -	+ -	+ -
One other object	+	+	+	+	+	+
Two other objects	-	-	-	-	-	-
More than two objects	-	-	-	-	-	-
Centrality	+ -	+ -	+ -	+ -	+ -	+ -
90 degree angle	+ -	+ -	+ -	+ -	+ -	+ -
Sided one face of object	-	-	-	-	-	-
Sided one face of object & base	+ -	+ -	+ -	+ -	+ -	+ -
Sided two sides of object on opposite faces	-	-	-	-	-	-
Sided four sides of object	-	-	-	-	-	-
Sided all faces except one	-	-	-	-	-	-
Sided all faces	-	-	-	-	-	-
Horizontal plane	+ -	+ -	+ -	+ -	+ -	+ -
Projective plane	+ -	+ -	+ -	+ -	+ -	+ -
Vertical Plane	+ -	+ -	+ -	+ -	+ -	+ -
Movement/path	-	-	-	-	-	-

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

4.2.7.1 Children age 5 to 6 years showing Typical Language Development.

All 46 children age 5 to 6 years showing TLD included in the main study responded to the prompts 'behind' and 'in front' and positioned objects symmetrically opposite using either a horizontal plane or a projective plane. Forty two children responded to the prompts for 'in front' and 'behind' (approximately 90 % of all children age 5 to 6 years showing TLD) and placed objects symmetrically opposite and centrally adjacent using a projective plane. Many children age 5 to 6 years showing TLD also verbalised comments that suggested confidence in acquired understandings e.g. "Facing that way to me" [Prompt – 'In front'] (5 yrs 5 mths 8 dys. TLD participant 1). "You have to see it" [Prompt – 'In front'] (5 yrs 5 mths 15 dys. TLD participant 88). "Here in the front…not the back" [Prompt - "In front"] (5 yrs 4 m 27 dys. TLD participant 93). "It's gone…at the back see" [Prompt – 'Behind'] (5 yrs 4 mths 11 dys. TLD participant 80). "Here you can't see it" [Prompt – 'Behind'] (5 yrs 0 mths 16 dys. TLD participant 82). Twenty four children who configured objects in this way or approximately 57 % of the children from this group, selected one object and placed the object centrally adjacent to another object in the space between themselves and the reference point to demonstrate 'in front' and then an object was selected and symmetrically placed objectively to the properties of a reference point to demonstrate the features of 'behind'.

Approximately 43 % or 18 of the children who responded to the prompts for 'in front' and 'behind', selected one object and placed the object in the space between themselves and centrally adjacent to the reference point to demonstrate 'behind'. An object was symmetrically placed objectively and centrally adjacent to the properties of a reference point to demonstrate the features of 'in front of'. The four other children showing TLD ranging from 5 years 3 months and 5 years 8 months (approximately 9 % of all the age 5 to 6 years children showing TLD) placed objects symmetrically opposite using a horizontal plane or at a 90 degree angle for each individual configuration as viewed by the participant. Two of the children responded by selecting one object and placing the object centrally adjacent to the left of another to demonstrate 'behind' and an object symmetrically to the right to demonstrate 'in front'. The two other children selected one object and placed the object centrally adjacent to the right of another to demonstrate 'behind' and an object symmetrically to the left to demonstrate 'in front'. When configuring features contact was always

made between the base of the objects selected and being positioned and the surface of the table but contact was not always made horizontally between the selected and placed objects and the other static object.

4.2.7.2 Children age 4 to 5 years showing Typical Language Development.
The analysis of data for the responses to the prompts 'behind' and 'in front' showed that 2 of the 60 participants did not respond to either the 'in front' or the 'behind' prompt. Fifty eight of the 60 children age 4 to 5 years showing TLD in the main study did respond to either or both the prompts. Each of the prompts 'in front' and 'behind' was administered separately. One child only responded to the prompt for 'behind'. Forty three children (approximately 75 % of the 57 children who responded to both the 'in front' and 'behind' prompt) used a projective plane when configuring objects. Approximately 77 % of these 43 children (33 children) responded to the prompts for 'in front' and 'behind' and selected one object and placed the object centrally adjacent to another object in the space between themselves and the reference point to demonstrate 'in front'. Following the prompt for 'behind' one object was selected and the object was centrally adjacent and symmetrically placed objectively to the properties of a reference point to demonstrate the features of 'behind'. Following the prompt 'in front' 10 of the 43 children age 4 to 5 years showing TLD (approximately 23 %) selected and configured an object by placing it centrally adjacent to another object and symmetrically placing it objectively to the properties of a reference point to demonstrate the features of 'in front of' and following the prompt 'behind' selected one object and placed the object centrally adjacent to another object in the space between themselves and the reference point to demonstrate 'behind'. Two children aged 4 to 5 years showing TLD used themselves as the referent and pointed to the front of their body in response to the prompt 'in front' and behind their body (touching their back) for 'behind'.

While projective centrally adjacent symmetrical configurations were representative of most of the 4 to 5 year old participants showing TLD four children or approximately 7 % of this group who responded to both the prompt for 'in front' and the prompt for 'behind' positioned objects centrally adjacent to another object symmetrically in a horizontal plane. The four children showing TLD ranged from 4 years and 3 months to 4 years and 8 months. Following the prompt 'in front' two of these four children selected an object and placed it centrally adjacent directly to the

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right of one other object. These two children also selected one object and placed the object centrally adjacent directly to the left of another to demonstrate 'behind' following the prompt. Two children selected and placed an object centrally adjacent to another object directly to the right to demonstrate 'behind' and following the prompt 'in front' selected and placed an object directly to the left of another.

Four children age 4 to 5 years old showing TLD (approximately 7 % of the 58 children who responded) selected and placed objects non-symmetrically. These children selected and placed an object centrally adjacent to the left of another in response to the prompt 'in front' and in response to the prompt 'behind' the children selected and placed an object symmetrically objectively to the properties of a reference point to demonstrate the features of 'behind' as viewed by the participant as seen in Figure 4.1. Essentially the data collected from individual observations related to the prompts 'behind' and 'in front', once collated, showed children configured objects at a 90 degree angle from one object placement to another.

Other similar configurations of objects was observed as two other children or approximately 3 % of those children who responded to the prompt 'in front' and 'behind' also selected and placed objects centrally adjacent to another object non symmetrically but 90 degree angle between each objects to demonstrate features of 'behind' and 'in front' following the individual prompts as seen in Figure 4.2. Therefore a total of 6 children age 4 to 5 years showing TLD configured the object selected using a 90 degree placement in relation to one other object.
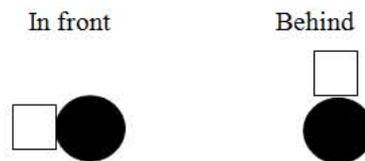
In front   Behind

Figure 4.1. Configuration of objects to demonstrate the prepositions 'in front' and 'behind' showing centrally adjacent positioning by children 4 to 5 years showing Typical Language Development as viewed by the participant.
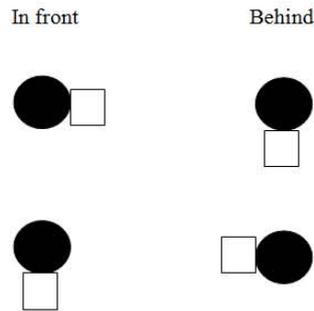
Figure 4.2. Configuration of objects to demonstrate the prepositions 'in front' and 'behind' showing centrally adjacent non symmetrical 90 degree angle between each objects positioning by children age 4 to 5 years showing Typical Language Development as viewed by the participant.

Two children selected and configured objects as seen in Figure 4.3.
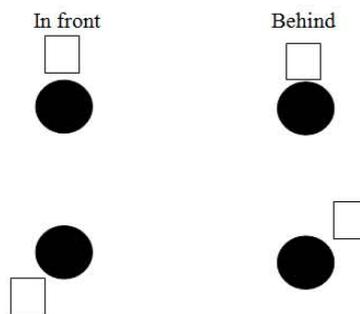
Figure 4.3. Configuration of objects in response to the prompts 'in front' and 'behind'   showing positioning in two children age 4 to 5 years showing Typical Language Development as viewed by the participant.

When configuring objects in response to the prompts 'in front' and 'behind' contact was always made between the base of the objects selected and positioned and the surface of the table but contact was not always made between the target object and the other object by those children that did respond to the prompt.

4.2.7.3 Children with Specific Language Impairment age 5 to 6 years. One child with SLI who responded to the prompt 'in front' selected one object and placed it centrally adjacent at a 90 degree angle to the right of another object as viewed by the participant. The child did not respond to the prompt 'behind'. Twenty four children with SLI age 5 to 6 years who were participants in the main study responded to the prompts 'behind' and 'in front'. Of these children 18 (approximately 75 % of those that responded) configured the preposition prompts 'behind' and 'in front' as opposites in either a horizontal or projective plane. Fourteen children (approximately 78 % of these children) placed objects to demonstrate 'behind' and 'in front' using a horizontal front to back plane. Nine children (approximately 64 %

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of the children who used a horizontal plane) selected one object and then placed the object centrally adjacent to another object in the space between themselves and the reference point to demonstrate 'in front'. Following the prompt 'behind' an object was selected and symmetrically placed objectively to the properties of a reference point to demonstrate the features of 'behind'. Five children (approximately 36 % of those that used a projective plane) selected an object and placed the object centrally adjacent to another object in the space between themselves and the reference point to demonstrate 'behind'. An object was selected and symmetrically placed objectively and centrally adjacent to the properties of a reference point to demonstrate the features of 'in front'. Four children (approximately 22 % of those who responded by demonstrating 'behind' and 'in front' as opposites) placed objects centrally adjacent to another object and symmetrically opposite using a horizontal plane or at a 90 degree angle for each individual configuration as viewed by the participant. All four children selected one object and placed the object centrally adjacent to another object to the right or at a 90 degree angle as viewed by the participant to demonstrate 'in front' and following the prompt 'behind' these children selected one object and placed it centrally adjacent to another object to the left or at a 90 degree angle as viewed by the participant of another.

Collation of the data for each of the separate preposition prompts for 'in front' and 'behind' also shows five children (approximately 21% of those children who responded) placed the objects centrally adjacent to another object using a 90 degree angle between each object as viewed by the participant. Figure 4.4 shows the paired placements of these objects.
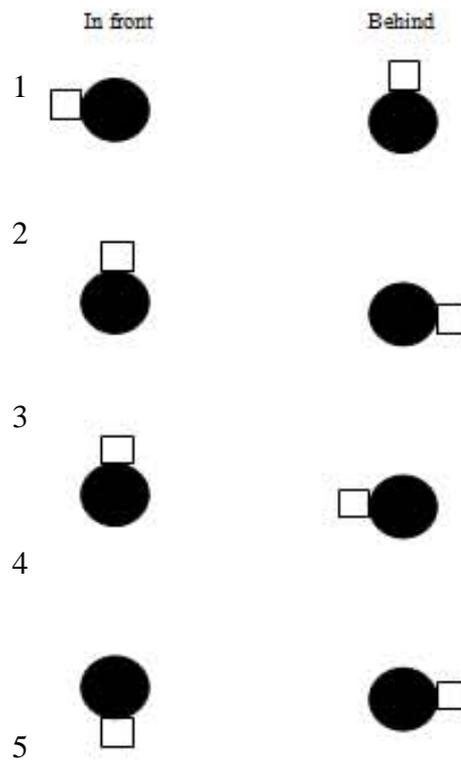
Figure 4.4. Configuration of pairs of objects showing a centrally adjacent 90 degree angle relationship between objects used as demonstrated by children with Specific Language Impairment age 5 to 6 years in response to prompts 'in front' and 'behind' as viewed by the participant.

Figure 4.5. An object selected and placed to the right of another object showing paired configurations in response to the prompts 'in front' and 'behind' as viewed by the participant.

One child selected one object following each of the prompts 'in front' and 'behind' and placed the object to the right of another object as viewed by the child (Figure 4.5).

There were a variety of configurations demonstrated by the children that ranged across the whole year span of 5 and 6 years. Two objects were always used by children with SLI age 5 to 6 years to configure the prepositions 'behind' and 'in front'. When configuring features contact was always made between the base of the object selected and positioned and the surface of the table but contact was not always made between the object selected and placed and the other object used in the configuration.

4.2.7.4 Summary of analysis. The data shows that there were similarities in the configuration of objects demonstrated and therefore the features understood by all the children in the main study. While similar, the extent in which these features were presented was different. Children age 5 to 6 years showing TLD primarily used a projective placement of objects that are centrally adjacent to another object at a 180 degree angle as viewed by the participant. To a much lesser degree children age 4 to 5 years showing TLD and children age 5 to 6 years with SLI configured objects in the same way but the frequency of these demonstrations was much lower. There was a tendency for children age 5 to 6 years with SLI to show a preference to use a horizontal placement of objects or a 90 degree configuration. While this was also observed in children age 4 to 5 years showing TLD it was not seen to the same extent as in the demonstrations by children with SLI age 5 to 6 years.

4.2.8 Behind, In Front and Next To

Table 4.19 shows mapping of semantic features for 'next to' children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years response to prompt 'next to'.

Table 4.19.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with SLI Age 5 to 6 Years in Response to the Prompt 'Next to'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	-	+ -	+ -
Contact Base	+	+ -	+
Horizontal Contact	+ -	-	-
One other object	-	+ -	+
Two other objects	+	-	-
More than two objects	-	+ -	-
Centrality	+	+ -	+ -
90 degree angle	+	-	-
Sided one face of object	-	-	-
Sided one face of object & base	+	-	-
Sided two sides of object on opposite faces	-	+ -	+ -
Sided four sides of object	-	-	-
Sided all faces except one	-	-	-
Sided all faces	-	+ -	+ -
Horizontal Plane	-	-	-
Projective plane	+ -	+ -	+ -
Vertical Plane	-	-	-
Movement/path	-	-	-

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

4.2.8.1 Children age 5 to 6 Years showing Typical Language Development.
All 46 children age 5 to 6 years showing TLD responded to the prompt for 'next to'.
Two objects were always used by the 46 children to configure the features for the
preposition 'next to'. Four children age 5 to 6 years showing TLD (Approximately 9
%) configured an object centrally adjacent to another objectively to the properties of
a reference point using a 180 degree angle and a horizontal plane as viewed by the
participant. Forty two children (approximately 90 %) configured the objects
centrally adjacent to another object using a left or right configuration 90 degree angle
of one object to another as viewed by the participant. Most of the participants (36
children or approximately 78 %) placed the object selected at a 90 degree angle to
the right as viewed by the participant. Some of the participants (6 children or
approximately 13 %) placed the object selected at a 90 degree angle to the left as
viewed by the participant. Objects centrally adjacent to another using either left or
right 90 degree angle positioning of objects related to the prompt 'next to' was
generally the preferred configuration of those participants that also placed objects
using a vertical configuration (180 degree angle as viewed by the participant) when
configuring objects for the prompt 'behind' and 'in front' respectfully.

In examining the analysis of the data for 'behind', 'in front' and 'next to' for
children age 5 to 6 years showing TLD it was seen that the majority of children (43
of the 46 children in the main study) configured the objects centrally adjacent to
another. They also used a 90 degree angle to the right or to the left of one object to
another object in relation to the preposition 'next to' while also using a vertical and
symmetrical configuration in response to the prompts 'behind' and 'in front' (Table
4.20). Interestingly, the three children who did not use a projective plane
configuration for 'in front' and 'behind' also did not use a 90 degree angle when
selecting and configuring an object in response to the prompt 'next to'.

Table 4.20.

Children Age 5 to 6 Years Showing Typical Language Development 90 Degree Angle Configuration of One Object to Another Object in Relation to the Prompt 'Next to' Showing Comparisons to Vertical 'Behind' and 'In Front' Configuration

Total Participants	90 degree angle left or right configuration	Projective configuration of behind or in front an object listed as viewed by the participant
27	Right	Behind
		In front
10	Right	In front
		Behind
3	Left	Behind
		In front
3	Left	In front
		Behind

4.2.8.2 Children age 4 to 5 years showing Typical Language Development.
Ten of the 60 children age 4 to 5 years showing TLD did not respond to the prompt 'next to'. Forty three of the 50 children who responded (86 %) selected one object and configured the object centrally adjacent to one other object using a left or right configuration 90 degree angle of one object to another as viewed by the participant. Six of these 42 children (approximately 14 %) selected and configured the object to the left of another using a 90 degree angle and 37 of the 42 children (approximately 88 %) configured the object selected to the right of another using a 90 degree angle. Two of the 50 children who responded selected an object and placed the object centrally adjacent to another in the space between themselves and the reference point to in response to the prompt 'next to'. Four of the 50 children who responded selected one object and placed the object objects at neither a 90 degree angle or in the space between themselves and the reference point or symmetrically placed objectively to the properties of a reference point to in response to the prompt 'next to'. These configurations can be seen in Figure 4.6. One other child selected an object and placed it on the far left on the edge of the table being used to support the objects for the demonstrations.

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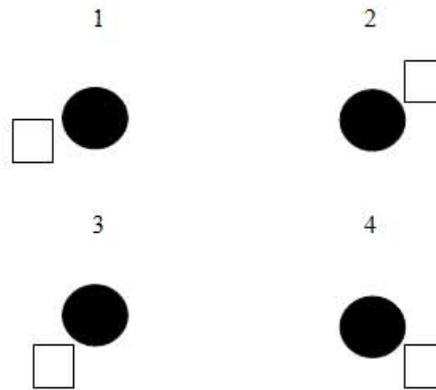
Figure 4.6. Children age 4 to 5 years showing Typical Language Development configuration of one object selected and placed by another object in response to the prompt 'next to' as viewed by the participant.

In examining the data of responses to the prompt 'behind', 'in front' and 'next to' for children age 4 to 5 years showing TLD it can be seen that the majority of children (Approximately 62 % of the 60 children age 4 to 5 years showing TLD in the main study) configured the objects centrally adjacent to another using a 90 degree angle to the right or to the left of one object to another object in relation to the preposition 'next to' while also using a vertical and symmetrical 'behind' (object was symmetrically placed objectively to the properties of a reference point) and 'in front' (object and placed the object in the space between themselves and the reference point to demonstrate).

Table 4.21.

Children Age 4 to 5 Years Showing Typical Language Development Use a 90 Degree Angle of One Object to Another Object in Relation to the Preposition 'Next to' Showing Comparisons to Vertical 'Behind' and 'In Front' Configuration

Total Participants	90 degree angle left or right configuration	Projective configuration of behind or in front an object listed as viewed by the participant
21	Right	Behind
		In front
8	Right	In front
		Behind
7	Left	Behind
		In front
1	Left	In front
		Behind

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Mapping of the configuration of the placements of one object selected and placed using a 90 degree angle centrally adjacent to one other object showing comparisons to projective configurations of the object in response to the prompts 'in front' , 'behind' and 'next to' by children age 4 to 5 years showing TLD can be seen in Table 4.21. Figure 4.7 demonstrates configuration of features for the 11 children who did not use a projective plane placement of 'behind' and 'in front' or a 90 degree angle positioning of the object selected in response to the prompt 'next to'. Configuration of the objects centrally adjacent to another is apparent in some configurations. One child who had used themselves to reference 'in front' and 'behind' selected one object and placed the object in the space between themselves and the reference point of another object on the table in response to the prompt 'next to'.
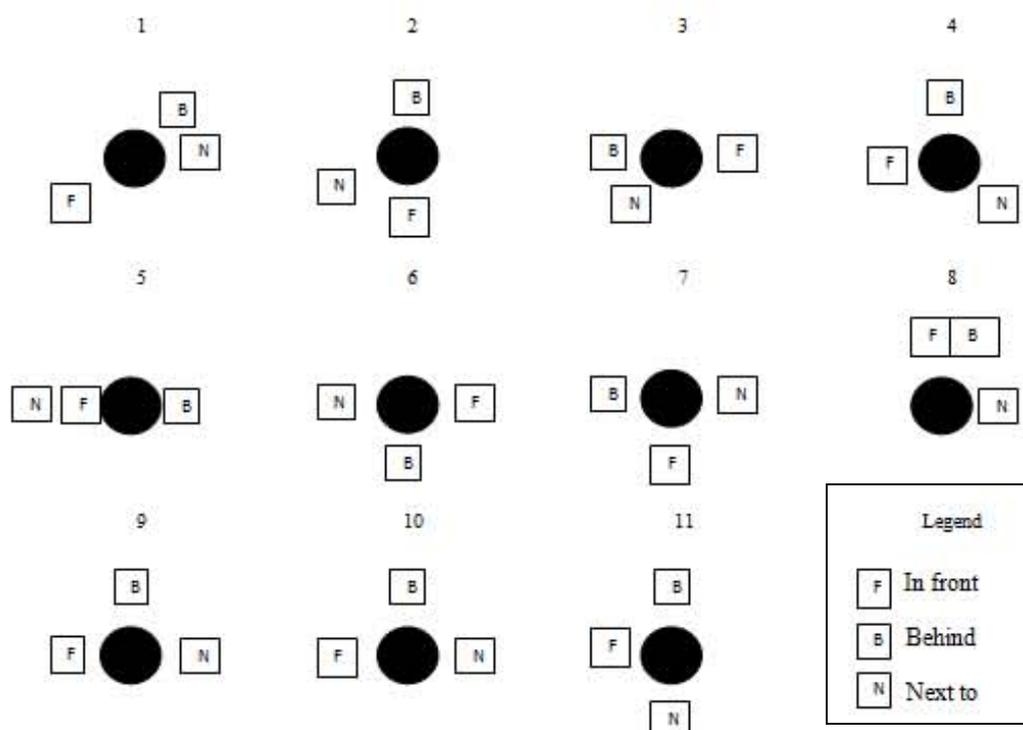
Figure 4.7. Configuration of 'next to', 'in front' and behind' for those children who did not use both a projective plane during placement of objects in response to the prompts of 'behind' and 'in front' together with 90 degree angle positioning in response to the prompt 'next to' by children age 4 to 5 years showing Typical Language Development as viewed by the participant.

4.2.8.3 Children with Specific Language Impairment age 5 to 6 years. All 25 child participants with SLI age 5 to 6 years responded to the prompt 'next to'. Two objects were always used by these children with SLI age 5 to 6 years to configure the objects in relation to the preposition 'next to'. Seventeen children (68 % of the

children who responded) configured an object centrally adjacent to another using a left or right configuration 90 degree angle of one object to another as viewed by the participant. This is less than the children age 5 to 6 years showing TLD (90 %) and children age 4 to 5 years showing TLD (73 %) who also responded to the prompt 'next to'. Three children with SLI age 5 to 6 years selected and configured the object centrally adjacent to the left of another and 14 children (approximately 82 % of those children who used a 90 degree angle configuration) configured the object selected to the right of another. Eight children (32 % of the children who responded to the prompt 'next to') did not position one object at a 90 degree angle from another object as viewed by the participant to demonstrate 'next to'. Four children selected an object and placed the object in the space directly between themselves and the reference point to demonstrate features of 'next to'. Two children selected an object and placed it to the left of another object and two children selected an object and placed it to the right of another object as seen in Figure 4.8.

Of the 25 child participants with SLI age 5 to 6 years who responded to the prompt 'next to' 22 children (88 %) positioned both objects used so there was contact/touching of one of the faces/sides to the other object used. Three children did not have the two objects touching another. No child with SLI aged 5 to 6 years self referenced by placing objects when demonstrating 'next to'. Eleven children configured objects using both a projective plane together with a 90 degree angle of one object to another object in response to the prompt 'next to'.

Figure 4.8. Placement of objects demonstrating left and right configuration of non 90 degree angle object placement for the prompt 'next to' by children with Specific Language Impairment age 5 to 6 years as viewed by the participant.

The following gives an overview of the data and findings for children with SLI age 5 to 6 years related to the prompts 'behind', 'in front' and 'next to'. The majority of SLI children age 5 to 6 years (32 % of the 25 children in the main study) configured one object centrally adjacent to another using a 90 degree angle to the right or to the left of one object to another object in relation to the preposition 'next to' while also using a projective plane with objects placed symmetrical 'behind' (object was symmetrically placed objectively to the properties of a reference point) and 'in front' (object and placed the object in the space between themselves and the reference point to demonstrate). This data can be seen in Table 4.22.

Configuration of objects in response to the prompts 'next to', 'in front' and behind' for those children who did not configure objects using vertical placement of 'behind' and 'in front' together with a 90 degree angle positioning for 'next to' by children with SLI age 5 to 6 year old can be seen in Figure 4.9.

Mapping of the configuration of the placements of objects by child participants with SLI age 5 to 6 years in response to the prompt 'next to' and in relation to their configurations for 'in front' and behind' can be seen in Figure 4.10. This demonstrates configuration of features for those children who did not use vertical placement of 'behind' and 'in front' or a 90 degree angle positioning when responding to the prompt 'next to'. The configuration of one object centrally adjacent to the central object is apparent in some cases.

Table 4.22.

Children with Specific Language Impairment Age 5 to 6 Years 90 Degree Angle of One Object to Another Object in Relation to the Prompt 'Next to' Showing Comparisons to Vertical 'Behind' and 'In Front' Configuration

Total Participants	90 degree angle left or right configuration	Projective configuration of behind or in front an object listed as viewed by the participant
7	Right	Behind
		In front
2	Right	In front
		Behind
1	Left	Behind
		In front
1	Left	In front
		Behind
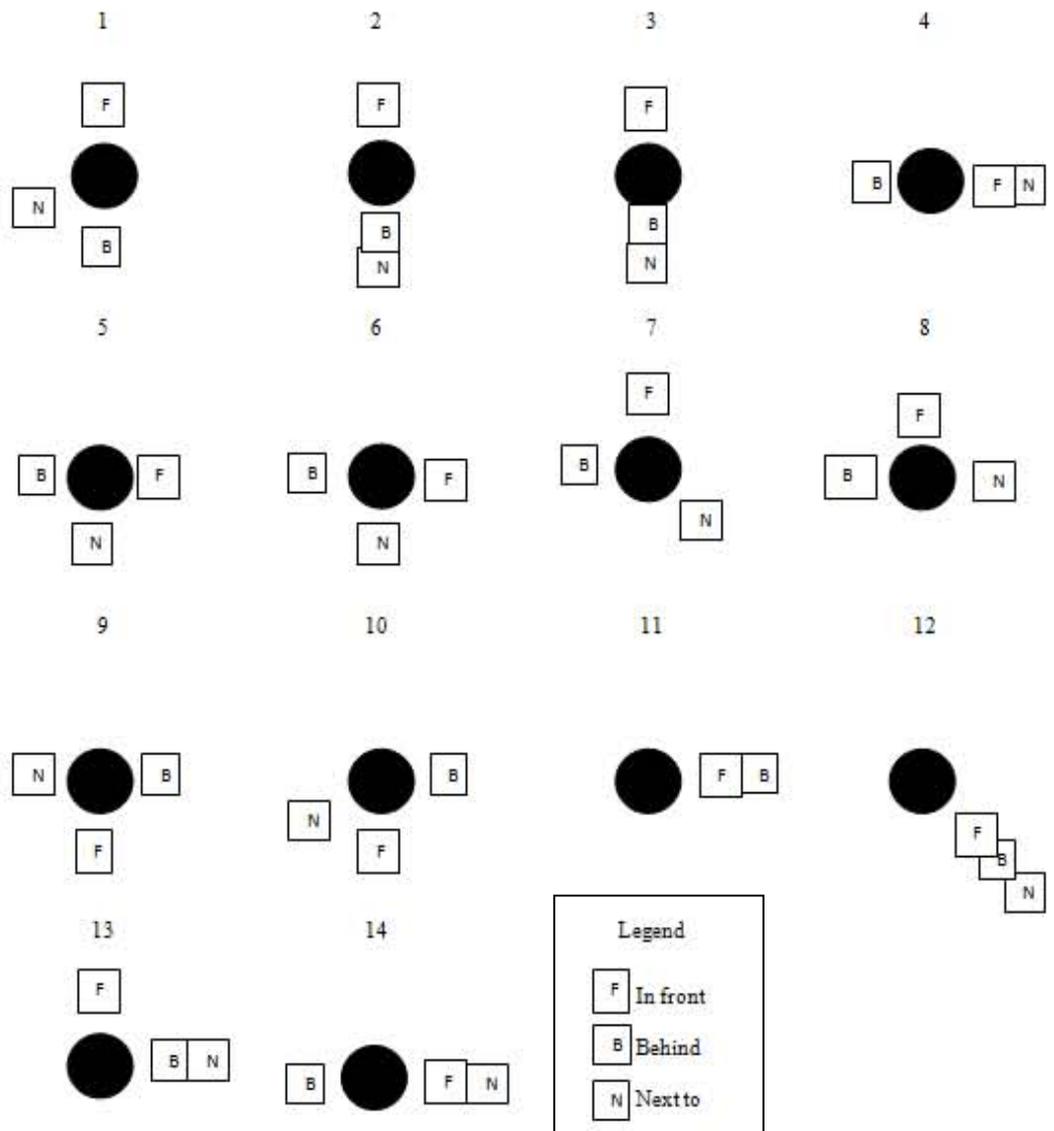
Figure 4.9. Configuration of objects in response to the prompts 'next to', 'in front' and behind' for those children who did not configure objects using vertical placement of 'behind' and 'in front' together with a 90 degree angle positioning for 'next to' by children with Specific Language Impairment age 5 to 6 years as viewed by the participant.
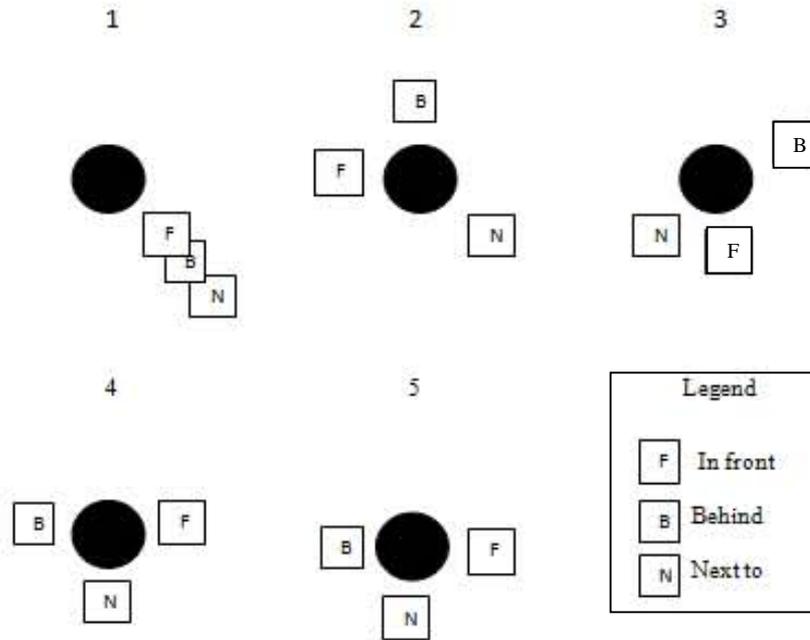
Figure 4.10. Configuration of objects in response to the prompts 'next to', 'in front' and behind' for those children who did not use either a vertical placement of 'behind' and 'in front' or a 90 degree angle positioning for 'next to' when configuring objects by children with Specific Language Impairment age 5 to 6 years as viewed by the participant.

4.2.8.4 Summary of analysis. Analysis of the data highlighted that twice as many children age 5 to 6 years showing TLD compared to children with SLI age 5 to 6 years are likely to configure objects symmetrically using a projective plane with an object placed in the space between themselves and the reference point to demonstrate 'in front' and an object placed objectively to the properties of a reference point in response to the prompt 'behind' together with a 90 degree angle for the object placed and viewed by the participant to demonstrate 'next to'. Handiness dominance could have determined left or right configurations but this was not assessed. Table 4.23. shows the percentage of responses for each semantic feature to the prompt 'behind' and 'in front' in children 5 to 6 Years showing TLD, children 4 to 5 Years Showing TLD and children with SLI 5 to 6 Years old.

Table 4 23.

Responses to the Prompts 'Behind' and 'In front' in Children 5 to 6 Years Showing Typical Language Development, (n=46) Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language Impairment 5 to 6 Years (n=25)

Configuration of objects	Percentage of responses		
	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
Projective symmetrical configuration self-referenced or of one object objectively placed in relation to another object and one object placed in space between participant	91.30%	71.66%	56%
Horizontal symmetrical configuration of one object placed in relation to another	8.69%	6.66%	16%
Non -symmetrical placement of objects	0%	18.33%	24%
No response	0%	3.33%	4%

4.2.9 Between

An overview of the semantic features demonstrated by the participants in the main study in response to the prompt 'between' can be seen in Table 4.24.

Table 4.24.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Between'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	+ -	+ -	+ -
Contact Base	+	+	+
Horizontal Contact	+ -	+ -	+
One other object	+ -	+ -	+ -
Two other objects	+ -	+ -	+ -
More than two objects	-	-	-
Centrality	+ -	+ -	+ -
90 degree angle	+ -	+ -	+ -
Sided one face of object	-	-	-
Sided one face of object & base	+ -	+ -	+ -
Sided two sides of object on opposite faces	+ -	+ -	+ -
Sided four sides of object	-	-	-
Sided all faces except one	+ -	+ -	+ -
Sided all faces	-	-	-
Horizontal plane	+	+	+ -
Projective plane	-	-	-
Vertical plane	-	-	-
Movement/path	-	-	-

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

4.2.9.1 Children age 5 to 6 Years showing Typical Language Development. Twenty children (approximately 44 % of all the children age 5 to 6 years showing TLD in the main study) selected one object then subsequently selected two other objects and placed them directly opposite to each other with the first object selected in the middle of the other two. A horizontal plane was used to position the objects (180 degree angle as viewed by the participant). This meant that one object was selected and the two opposite sides of the object that was placed in the centre were either in contact or shielded by one face of each of the objects horizontally and centrally adjacent to it. The outer two objects were either in contact or shielded by the centre object by one face. Fifteen children selected one object and placed two identical objects (wooden blocks) directly opposite to each other with the object selected in the middle.   The other 5 children selected one object and configured it as described with two other non-identical objects provided. All the objects selected and placed by the participants did not always make contact with each other but all bases of the objects made contact with and were supported by the surface of the table. Four children (approximately 9 %) selected and placed one object in the centre of the hoop. Twenty two typically language developing 5 to 6 year old children (approximately 48 %) did not respond to the prompt for the preposition 'between'.

4.2.9.2 Children age 4 to 5 years showing Typical Language Development. Of the 60 participants 11 children (approximately 18 %) selected one object then subsequently selected two other objects and placed each object directly opposite to the other with the first object selected placed in the middle of the other two. A horizontal plane was used to position the objects (180 degree angle as viewed by the participant). This meant that one object was selected and the two opposite sides of the object that was placed in the centre were either in contact or shielded by one face of each of the objects horizontally and centrally adjacent to it. The outer two objects were either in contact or shielded by the centre object by one face. Eight children selected one object and placed two identical objects (wooden blocks) directly opposite to each other with the object selected in the middle. Three children selected one object and configured it as described with two other non-identical objects provided. All the objects selected and placed by the participants did not always make contact with each other but all bases of the objects made contact with and were supported by the surface of the table. Three children (5 %) selected and placed one object in the centre of the flat hoop as seen in Figure 4. Four children

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(Approximately 8%) selected one object and placed it centrally adjacent to another object objectively to the properties of a reference point. Forty two children 4 to 5 years showing TLD (approximately 70 %) did not respond to the prompt for the preposition 'between'.

    4.2.9.3 Children with Specific Language Impairment age 5 to 6 years. Of the 25 children with SLI age 5 to 6 years, 4 children (16 %) of the 25 did not respond to the prompt 'between' by selecting or configuring objects. Six children (approximately 29 % of those children who responded to the prompt 'between') selected one object then subsequently selected two other objects and placed them directly opposite to each other with the first object selected in the middle of the other two. A horizontal plane was used to position the objects (180 degree angle as viewed by the participant). All six children selected one object and placed two identical objects (wooden blocks) directly opposite to each other with the object selected in the middle. All the object bases made contact with and were supported by the surface of the table. The two outside objects made contact horizontally by one face and the centre object by two opposite faces. Eight children (approximately 38 % of those children who responded to the prompt 'between') selected one object and positioned it centrally adjacent to the right of another object using a 90 degree angle as viewed by the participant. Two children (approximately 10 %) used two objects, selecting and moving one object to be centrally adjacent to the left of another object. Collectively this means that 10 children (approximately 48 % of those children who responded to the prompt 'between') selected one object and configured the object centrally adjacent to one other object either to the left or the right using a 90 degree angle. Four children (approximately 19 %) selected and placed one object in the centre of the hoop. One child selected an object and placed it inside the container.

    4.2.9.4 Summary of analysis. Almost a third of the children age 4 to 5 years showing TLD and nearly half the children age 5 to 6 years showing TLD responded and used three objects. The objects were configured using a horizontal plane and 90 degree placement. There was little deviation from this placement by the children with TLD age 5 to 6 years with a just few children showing understanding by selecting one object and placing it in the centre of the hoop. There was an element of symmetry expressed as most children used two identical objects to be the either side of the central object in their configurations. Symmetry was listed as a component or feature in the descriptive data as 'Sided two sides of object on opposite faces'

demonstrating that the centrally selected object was shielded by the two objects on either side in the configuration. In contrast to this almost half the children with SLI age 5 to 6 years who responded to the prompt 'between' only used two objects placing one object centrally adjacent to one other object using a horizontal plane. A small number of children showing TLD age 4 to 5 years also used this configuration. Table 4.25. shows the percentage of responses for each semantic feature to the prompt 'between' in children 5 to 6 Years showing TLD, children 4 to 5 Years Showing TLD and children with SLI 5 to 6 Years old.

Table 4.25.
Responses to the Prompt 'Between' in Children 5 to 6 Years Showing Typical Language Development, (n=46) Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language Impairment 5 to 6 Years (n=25)

	Percentage of responses		
Configuration of objects	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
Containment	8.69%	5%	20%
Contact base	56.52%	30%	84%
Centrality	8.69%	5%	20%
Horizontal Contact	23.91%	13.33%	32%
One other object	8.6%	11.66%	40%
Two other objects	47.82%	18.33%	24%
90 degree angle	47.82%	25%	64%
Sided one face of object & base	47.82%	11.66%	40%
Sided two sides of object on opposite faces	47.82%	18.33%	24%
Horizontal plane	47.82%	25%	64%
No response	48%	70%	16%

4.2.10 Through

Mapping of semantic features for 'behind' and 'in front' for TLD 5 to 6 years TLD age 4 to 5 years and children with SLI age 5 to 6 years response to prompt 'through' can be seen in Table 4.26.

4.2.10.1 Children age 5 to 6 years showing Typical Language Development. More than 60 % (28 participants) of children age 5 to 6 years showing TLD in the main study selected one object and while holding it inserted it through the opening in the hoop from one side to another. Five participants (approximately 11 % of the children age 5 to 6 years showing TLD) selected one object and placed one face of it in the centre of the hoop which was on the surface of the table. One child selected the hoop and held it approximately 10 centimetres above the table surface and pushed a wooden block under the hoop from one edge of the hoop to the opposite edge as demonstrated in Figure 4.11.

One child threw (possibly misheard the prompt) an object on to the floor in response to the prompt 'through'. Eleven (approximately 24 %) of the 46 children age 5 to 6 years showing TLD did not respond to the prompt for the preposition 'between' by selecting or moving objects.
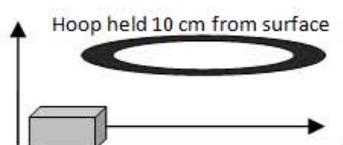
Figure 4.11. Horizontal movement of one object under the hoop in response to the prompt 'through'.

Table 4.26.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Through'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years
Containment	+ -	+ -	+ -
Contact Base	+ -	+ -	+ -
Horizontal Contact	-	-	-
One other object	+	+	+ -
Two other objects	-	-	-
More than two objects	-	-	+ -
Centrality	+ -	+ -	+ -
90 degree angle	-	+ -	-
Sided one face of object	-	-	-
Sided one face of object & base	+ -	+ -	-
Sided two sides of object on opposite faces	-	-	+ -
Sided four sides of object	+ -	+ -	+ -
Sided all faces except one	+ -	+ -	+ -
Sided all faces	-	-	+ -
Horizontal Plane	+ -	+ -	+ -
Projective plane	+ -	+ -	+ -
Vertical Plane	+ -	+ -	+ -
Movement/path	+ -	+ -	+ -

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

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4.2.10.2 Children age 4 to 5 years showing Typical Language Development.
Thirty two (approximately 53 %) of the 60 participants age 4 to 5 years showing
TLD did not respond to the prompt for the preposition 'between' by selecting or
moving objects. Eighteen participants (30 % of all the children age 4 to 5 years
showing TLD) selected one object and inserted it through the opening in the hoop
and moving it from one side to the other side.

Two children selected one object and placed it centrally adjacent at a 90 degree
angle directly next to another object. Three children selected and placed a wooden
block in the container. Three children selected one object and placed one face of it in
the centre of the hoop which was on the surface of the table. Two participants
selected one wooden block and moved it up and over another as demonstrated in
Figure 4.12 .
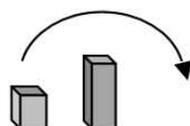
Figure 4.12. One wooden block was lifted and moved up and over another wooden block in response to the
prompt 'through'.

4.2.10.3 Children with Specific Language Impairment age 5 to 6 years. Ten
of the 25 participants age 5 to 6 years with SLI (40 %) did not respond to the prompt
for the preposition 'through' by selecting or moving objects. Nine children (36 %)
with SLI children age 5 to 6 years selected one object and pushed it through the hoop
from one side to the other of the hoop. One child selected a wooden block and
pushed it through the centre of the hoop but stopped and held the block in a static
position then pulled the wooden block back the way it had been inserted. One child
selected two different objects and placed them approximately 8 centimetres apart
then pushed one wooden block between the two objects from one side to the other
along a projective plane as demonstrated by Figure 4.13.

Two children selected one object and placed one face of it in the centre of the
hoop which was on the surface of the table. One child selected an object and placed
it in a container. One child placed an object directly under the base of the container
that had the opening at the top. This configuration meant that the opposite faces of
the object beneath the other object were in contact with the surface of the table and
the base of the container or the bottom of the lid.

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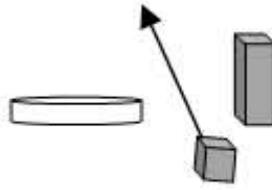
Figure 4.13. One object moved between two objects in a vertical plane in response to the prompt 'through'.

4.2.10.4 Summary of analysis. There were a similar number of children from each of the groups who did not respond to the prompt 'through'. Most children who did respond chose to select one object and insert it through the opening in the hoop moving it from one side to the other side. A larger proportion of children age 5 to 6 years showing TLD than children with SLI age 5 to 6 years or the children age 4 to 5 years showing TLD displayed these features. Some children showing TLD from both age groups verbalised while configuring objects "It has to be open…you can put it through" [5 yrs 8 mths 23 days. TLD participant 84]. There was an element of partial containment as the object inserts into the boundary and four faces of it (vertical faces top and bottom and opposite horizontal faces) were momentarily shielded.

There were some children in each of the groups that demonstrated their understanding of 'through' by displaying features such as centrality and containment that had been observed in response to the prompt 'in' and 'on', vertical movement observed in response to 'over' and 90 degree positioning seen in response to 'next to'. Some children verbalised while selecting and moving objects e.g. "It can sit in the middle like that" [Placed in the centre of the hoop] [4 yrs 11 mths 0 dys. SLI participant 24] "Together" [1 object was selected and placed touching another object] [5 yrs 11 mths 3 dys. SLI participant 23]. A greater percentage of static configurations such as these were more prominently observed in the children with SLI who responded than in the children showing TLD who responded. Table 4.27. shows the percentage of responses for each semantic feature to the prompt 'through' in children 5 to 6 Years showing TLD, children 4 to 5 Years Showing TLD and children with SLI 5 to 6 Years old.

Table 4.27

Responses to the Prompt 'Through' in Children 5 to 6 Years Showing Typical Language Development, (n=46)
Children 4 to 5 Years Showing Typical Language Development (n=60) and Children with Specific Language
Impairment 5 to 6 Years (n=25)

Configuration of objects	Percentage of responses		
	Children 5 to 6 years showing Typical Language Development	Children 4 to 5 years showing Typical Language Development	Children 5 to 6 years with Specific Language Impairment
Containment	10.86%	10%	12%
Contact base	13.03%	13.33%	16%
Centrality	10.86%	13.33%	8%
One other object	73.91%	46.66%	%
90 degree angle	0%	3.33%	0%
Sided one face of object & base	2.17%	3.33%	0%
Sided two sides of object on opposite faces	0%	0%	%
Sided four sides of object	73.91%	30%	40%
Sided all faces except one	10.86%	5%	4%
Sided all faces	0%	0%	4%
Horizontal plane	2.17%	3.33%	0%
Projective plane	60.86%	30%	44%
Vertical Plane	2.17%	1.66%	%
Movement/path	63.04%	33.33%	%
No response	23.91%	53.33%	40%

4.2.11 Compare and Contrast of Semantic Features - Children Age 5 to 6 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years

Collectively the data collected in response to all the preposition prompts shows some similarities in the semantic features configured by children with SLI age 5 to 6 years and the age matched children showing TLD.

Centrality is a feature that is seen in all the responses by the children with SLI age 5 to 6 years. The responses to prompts by children age 5 to 6 years showing TLD for the preposition 'in' showed configurations that did not demonstrate centrality. Other than this one preposition centrality is a theme for all other configuration of objects. The projective plane is configured as a feature by children with SLI age 5 to 6 years on much fewer occasions than children age 5 to 6 years showing TLD in response to the prompts 'behind' and 'in front'.

Overall there is a greater prevalence of containment, contact and centrality in the configuration of features in the responses of children with SLI age 5 to 6 years compared to their age matched peers showing TLD. While the features of containment, contact and centrality are used in the configuration of the objects it is the increased nature of the use in children with SLI that makes these features more prevalent for this group of children. There is also less stability in the configuration of features across some features of prepositions seen in the responses from children with SLI when choosing to configure objects. This is demonstrated by the increased variety of configurations demonstrated by children with SLI age 5 to 6 years when responding to the prompts.

There is an inclination for children with SLI age 5 to 6 years to use less objects and configure them using a proximity relationship than to choose more objects and therefore the need to configure more features and more relationships between objects. This was especially prominent in configurations of objects when the children responded to the prompt 'between'.

4.2.12 Overall Analysis of Data Collected in Stage 2 of the Main Study

The children in the main study were able to demonstrate many features in response to the prompts by selecting and configuring objects. The objects provided allowed the participants to construct different configurations such as static positioning, proximity, projective relationships, movement and direction. All children from each group quickly understood the protocol and the concept that verbal prompts from the researcher required them to select and arrange the objects. There were extremely few occasions during the demonstrations where children chose not to interpret the prompts as prepositions e.g. 'across' was interpreted 'a cross' [symbol], 'around' as 'a round' [shape] and 'through' as 'threw' [action] (homophones). It was felt that these limited occasions of misinterpretation only served to increase the

effectiveness of the protocol and the validity of the data. It is evidence that the children were easily able to comprehend the experience and consequently displayed genuine known features or their understandings related to the prepositions as the prompts in the protocol had intended.

On average there was a slightly higher response rate to some prompts from the children age 5 to 6 years showing TLD compared to the response rate from children with SLI age 5 to 6 years. No time limit was stipulated for each response. Overall it was intuitively felt by the researcher that quick selection of objects, quick configuration and subsequent rapid release of objects demonstrated a more positive response. The children age 5 to 6 years showing TLD and the children 4 to 5 years showing TLD tended to make positive responses by quickly configuring objects or if unsure they verbalised their uncertainty in understanding such as saying "I don't know that one' or "What's 'next to'?" Children with SLI age 5 to 6 years made either a positive response or they procrastinated when selecting objects then continued to configure them or attempted to discuss off topic subjects rather than verbalise uncertainty.

There were no patterns that emerged when the data was analysed to suggest any differences between male or female participants in any of the groups when configuring the semantic features.

Collectively the data shows similarities in the semantic features configured by children with SLI age 5 to 6 years and the age matched children showing TLD. Table 4.28 shows the mapping of semantic features for children 5 to 6 years showing TLD in response to the prompts included in the protocol of the main study. Table 4.29 shows the mapping of semantic features for children 4 to 5 years showing TLD in response to the preposition prompts included in the protocol of the main study. Collecting and analysing the data from the children age 4 to 5 years showing TLD and the children age 5 to 6 years showing TLD eliminated the need to include younger children with SLI age 4 to 5 years in the main study. The children with SLI age 5 to 6 years included in the main study allowed the demonstration of a wide variety of semantic features related to the target list of prepositions included in the protocol prompts.

Table 4.30 shows the mapping of semantic features for children with SLI age 5 to 6 years in response to all the preposition prompts included in the protocol of the main study.

Table 4.28.

Mapping of the Semantic Features for Children 5 to 6 Years Showing Typical Language Development in Response to the Prompts Included in the Protocol of the Main Study

Component	In	On	Under	Over	Behind	In front of	Next to	Between	Through	Around	Across
Containment	+	-	+/-	-	-	-	+/-	+/-	+/-	+/-	-
Contact base	+	+	+/-	+/-	+	+	+	+	+/-	+/-	+/-
Horizontal contact	-	-	-	-	+/-	+/-	-	+/-	-	-	+/-
One other object	+	+	+	+	+	+	+	+/-	+	+/-	+/-
Two other objects	-	-	-	-	-	-	-	+/-	-	-	-
More than two objects	-	-	-	-	-	-	-	-	-	+/-	+/-
Centrality	-	+	+/-	+	+/-	+/-	+/-	+/-	+/-	+/-	+/-
90 degree angle	-	-	-	-	+/-	+/-	-	+/-	-	-	-
Sided one face of object	-	-	-	+/-	-	-	-	-	-	-	-
Sided one face of object & base	-	-	-	-	+/-	+/-	-	+/-	-	+/-	-
Sided two sides of object on opposite faces	-	-	+/-	-	-	-	+/-	+/-	-	-	+/-
Sided four sides of object	-	-	-	-	-	-	-	-	+/-	-	-
Sided all faces except one	+	-	-	-	-	-	-	+/-	+/-	+/-	-
Sided all faces	-	-	+/-	-	-	-	+/-	-	-	-	-
Horizontal plane	-	-	-	-	+/-	+/-	-	+	+/-	-	-
Projective plane	-	-	-	-	+/-	+/-	+/-	-	+/-	-	-
Vertical plane	-	-	+	+	+/-	+/-	-	-	+/-	-	-
Movement/path	-	-	-	+/-	-	-	-	-	+/-	+/-	+/-

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

Table 4.29.

Mapping of Semantic Features for Children 4 to 5 Years Showing Typical Language Development in Response to the Prompts Included in the Protocol of the Main Study

Component	In	On	Under	Over	Behind	In front of	Next to	Between	Through	Around	Across
Containment	+	-	+/-	-	-	-	+/-	+/-	+/-	+/-	-
Contact base	+	+	+/-	+/-	+	+	+/-	+	+/-	+/-	+/-
Horizontal contact	-	-	-	-	+/-	+/-	-	+/-	-	-	-
One other object	+	+	+/-	+	+	+	+/-	+/-	+	+/-	+/-
Two other objects	-	-	-	-	-	-	-	+/-	-	-	-
More than two objects	-	-	+/-	-	-	-	+/-	-	-	+/-	-
Centrality	+/-	+	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
90 degree angle	-	-	-	-	+/-	+/-	-	+/-	+/-	-	-
Sided one face of object	-	-	-	+/-	-	-	-	-	-	-	-
Sided one face of object & base	-	-	-	-	+/-	+/-	-	+/-	+/-	+/-	-
Sided two sides of object on opposite faces	-	-	+/-	-	-	-	+/-	+/-	-	-	-
Sided four sides of object	-	-	-	-	-	-	-	-	+/-	-	-
Sided all faces except one	+	-	-	-	-	-	-	+/-	+/-	+/-	-
Sided all faces	-	-	+/-	-	-	-	+/-	-	-	-	-
Horizontal plane	-	-	-	-	+/-	+/-	-	+	+/-	-	-
Projective plane	-	-	-	-	+/-	+/-	+/-	-	+/-	-	-
Vertical plane	-	-	+	+	+/-	+/-	-	-	+/-	-	+/-
Movement/path	-	-	-	+/-	-	-	-	-	+/-	+/-	+/-

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

Table 4.30.

Mapping of Semantic Features for Children with Specific Language Impairment 5 to 6 Years in Response to the Prompts Included in the Protocol of the Main Study

Component	In	On	Under	Over	Behind	In front of	Next to	Between	Through	Around	Across
Containment	+	-	+ -	+ -	-	-	+ -	+ -	+ -	+ -	-
Contact base	+	+	+	+ -	+	+	+	+	+ -	+	+ -
Horizontal contact	-	-	-	+ -	+ -	+ -	-	+	-	-	+ -
One other object	+	+	+	+	+	+	+	+ -	+ -	+ -	+ -
Two other objects	-	-	-	-	-	-	-	+ -	-	-	-
More than two objects	-	-	-	-	-	-	-	-	+ -	+ -	-
Centrality	+ -	+	+ -	+ -	+ -	+ -	+ -	+ -	+ -	+ -	+ -
90 degree angle	-	-	-	-	+ -	+ -	-	+ -	-	-	+ -
Sided one face of object	-	-	-	+ -	-	-	-	-	-	-	-
Sided one face of object & base	-	-	-	+ -	+ -	+ -	-	+ -	+ -	+ -	+ -
Sided two sides of object on opposite faces	-	-	+ -	-	-	-	+ -	+ -	+ -	-	+ -
Sided four sides of object	-	-	-	-	-	-	-	+ -	+ -	-	-
Sided all faces except one	+	-	-	-	-	-	-	-	+ -	+ -	-
Sided all faces	-	-	+ -	+ -	-	-	+ -	-	+ -	-	-
Horizontal plane	-	-	-	+ -	+ -	+ -	-	+ -	+ -	-	-
Projective plane	-	-	-	-	+ -	+ -	+ -	-	+ -	-	+ -
Vertical plane	-	-	+	+ -	+ -	+ -	-	-	+ -	-	-
Movement/path	-	-	-	+ -	-	-	-	-	+ -	+ -	+ -

Note. In interpreting the feature analysis tables a minus symbol [–] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [–] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

4.3 Adult Instrument Trial

Stage 3 of the study included the trials of the Adult Instrument which demonstrated the vast array of descriptive words that adults were able to use to describe the location and movement of objects in the images. An analysis of the data collated from the Adult Instrument trials demonstrates some of the language used (Figure 4.14 shows sections to differentiate the location of objects in the images of the trial Adult Instruments as viewed by the adult participant and Table 4.31. lists the language used by adults in the trial Adult Instruments). The analysis of the data from the four Adult Instrument trials (15 adult participants) showed the technical descriptive information adults used. Consequently it was felt that the wording contained in the instructions to participants in the first slide of the Adult Instrument Trial needed to be modified to encourage the adult participants to use more everyday preposition words. The instructions on the first slide of the trial Adult Instrument had stated that participants could use as many words as they wanted to describe the relationships between objects and most responses were straight forward and data was easily extracted. In some cases the type of descriptive language in the responses was probably not how adults would speak to young children or indeed how adults would generally speak to each other. While not wanting to restrict the use of language it was felt that in that there were enough incidences of this to warrant changing the instruction in the final Adult Instrument. This aimed to lessen these types of responses and allow more focus on preposition words. There was also an overreliance by some adults to use 'left' and 'right' to describe positions. Overuse of 'left' and 'right' in the written responses by some participants really did not enable a full picture of their adult understanding related to prepositions to emerge that could be compared and contrasted to that of children. Some adults used scientific technical language to describe the position or movement of objects rather than prepositions. Written responses from participants in the trials contained descriptive language that was technical and probably was not how adults would speak during general interactions with young children e.g. Slide 35. "To the left but three quarters of own distance from the blue shape" [Participant 2. Adult Instrument Trials]. Slide 52 "West of the green shape" [Participant 1. Adult Instrument Trials]. Slide 13. "Circumnavigating 360 degrees circling the square" [Participant 3. Adult Instrument Trials]. Short precise responses containing one preposition were deemed as

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representing prototypical positioning of objects e.g. every single adult participant in the trials responded to the image in slide 10 by completing the sentence using either just the preposition or the preposition and naming the object colour and naming the object a shape e.g. "…'in front' of the blue shape" or "…'in front" [Participant 1- 15. Adult Instrument Trials]. Some slides contained more than two objects and these were the images that tended to elicit more technical language in the responses. Adults also became highly descriptive when placements of objects in the trial Adult Instrument images were not deemed prototypical. In order to convey position the strategy used by adults was to include scientific or technical language to ensure positioning of objects was not ambiguous. A few participants in the trials simply chose to identify the target object with the physical edge of the screen rather than attempt to describe two or three positional relationships between objects seen within the image. These responses were minimal so no changes related to participants using these types of responses were made to the instructions to participants in the trial Adult Instrument or the final Adult Instrument. e.g. Slide 15. "Middle of the screen with the other objects". [Participant 9. Adult Instrument Trials]. Slide 41. "Middle of all three". [Participant 14. Adult Instrument Trials].
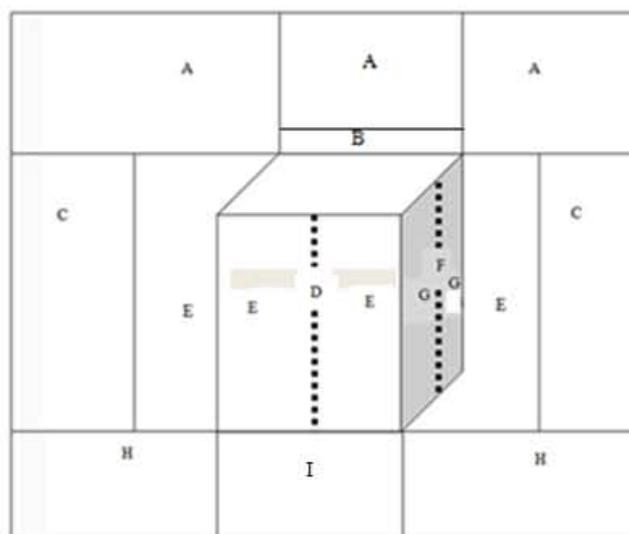
Figure 4.14. Sections to differentiate the location of objects in the images of the trial Adult Instruments as viewed by the adult participant.

Several adults in the Adult Instrument trials described the functional capabilities or predicted future movement of static objects in the images even though it was stated in the instructions to just describe the object location, position or movement e.g. Slide 45 "Supporting the other shape" [Participant 1. Adult Instrument Trials]. Slide 23. "The block is about to fall off the table" [Participant 4. Adult Instrument Trials]. Slide 54. "Moving towards the red shape" [Participant 8. Adult Instrument Trials]. Instructions were included in the first slide instructions of the final Adult Instrument for participants to avoid describing functional capabilities although there were still a few responses that did describe what the adult participant thought the objects seen in the images may or may not have being doing.

Table 4.31
Adult Use of Language, Prepositions and Other Supporting Words Used in the Trial Adult Instruments in Relation to the Sections Shown in Figure 4.14.

Section of Figure 4.	Supporting words
A	Above
	Right
	Left
	North West of
	North East of
B	Behind
	In front
C	Left of
	Right of
	Horizontal from
	West of
	East of
D	In front
	Behind
E	Left
	Right
	Beside
F	Next to
G	Front of
	Back of
H	Away from
	Near
	South west of
	South East of
	Diagonal to
	Below
	Bottom
	Square adjacent to
I	Underneath
	Beneath
	Below
	Bottom

4.3.1 Emergent semantic features. The data collected from 15 adult participants in the four trials were analysed. The findings were extremely useful in mapping the array of language that could be used to describe the position and location of objects. The trials served to assist in the fine tuning of the Adult Instrument and in making adjustments that enabled a more comprehensive method of collecting adult understandings related to the target preposition words. The following list of emergent semantic features was made from collating and analysing the responses from the trials:

- In - containment, contact
- On – contact. Central and non-central positioning.
- Over – movement.
- Behind/in front - opposite placement, fronting (objects having a designated front and back can be used as a reference)
- Under – partial or full cover, contact and non-contact. Central and non-central positioning.
- Next to - contact or non-contact.
- Between - contact or non-contact. Horizontal or projective plane. Movement.
- Through - movement
- Around – movement of 360 degree or less circumnavigating one other object
- Across – movement along a horizontal plane. Contact or non-contact with base.

4.4 The Adult Instrument

The following is an analysis of the responses to the images in the Adult Instrument conducted in Stage 3. The semantic features identified were then compared and contrasted to those identified in the analysis of the data collected from each of the groups of child participants in stage 2 of the main study.

The final Adult Instrument allowed the 32 adults to use highly descriptive language that was more focused on preposition use and reminiscent of oral speech than the language used in the Adult Instrument trials. Appendix J gives a complete overview of the adult participant responses to the images in the Adult Instrument. The changes made to the trial Adult Instrument meant that all adults responded to viewing the images using preposition words or preposition words combined with other phrases. It did however mean that some adults gave lengthy responses using a preposition combined with descriptive phrases in an attempt to be explicit e.g. Slide

59. "Next to but a bit far apart over to the side further away" [Participant 15. Adult Instrument].

Participants answered by giving short sentences which included just the preposition/s and no elaborating language e.g. Slide 15. "Next to' the square" [Participant 22. Adult Instrument].   The responses to prototypical prepositions or those where centrality or a centrally adjacent point was part of the feature of the image were only differentiated by how the participants chose to describe the objects on the screen e.g. Slide 43. "'Behind' the blue shape" [Participant 2. Adult Instrument]. Slide 19. "In front", [Participant 6. Adult Instrument]. Slide 56. "In front' of the object at the top". [Participant 14. Adult Instrument].

In the case of non-typical features phrases were added to preposition words to give further explanation to the description such as Slide 20 "Next to at the corner" [Participant 5. Adult Instrument]. Slide 48 "Above and slightly across" [Participant 11. Adult Instrument].   Slide 52 "Next to towards the back" [Participant 1. Adult Instrument]. This led to the assumption that if more information needed to be added then the image did not depict a prototypical example of the configuration of features for the given preposition.

4.4.1 In

Adults assigned the preposition 'in' to images that depicted objects as fully immersed in another object or the image that demonstrated inclusion by another object or where the referent object faces were shielded as in partial containment (Figure 4.15). The only images selected, where supporting words were not used, were image 8 and image 82 of the Adult Instrument (Table 4.32).   This could suggest that these configurations showing total immersion were seen as prototypical examples of the features of the preposition 'in'. Where the object was not centrally placed adult participants chose to assign the preposition 'inside'. No other supporting words were used by adult participants to describe the position of the target object. This suggests that this word allows for more flexibility in the features when describing the position of an object that is contained but not centrally placed. Where the preposition 'in' was assigned the common feature among all the images was centrality and containment. This was achieved either by full immersion within another object or by the referent object being centrally placed with the boundaries of other objects. The feature of contact was not a necessary component of the preposition 'in' for adults as seen in the selection of the Adult Instrument Image 82.

Image 4: 'In'   Image 8: 'In'

Image 31: 'In'   Image 55: 'In'

Image 58: 'In'   Image 82: 'In'
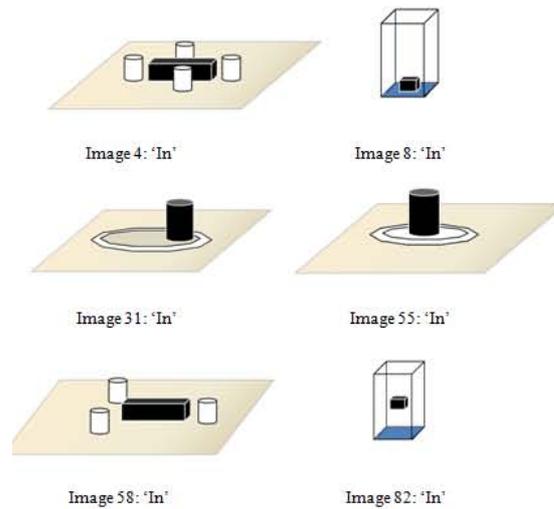
Figure 4.15. Images in the Adult Instrument that participants assigned the preposition 'in' demonstrating containment, inclusion by another object or where sides of the referent object faces were shielded as in partial containment.

Table 4.32.

Adult participant responses of the images in the Adult Instrument assigned the preposition 'In'

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
4	In	- (In) the middle of	29	90.625	-	-	-	- Surrounded by - Circled by	2 1	0
8	In	-	22	68.75	Inside	9	28.125	- At the bottom of	1	0
31	In (side)	-	25	78.125	On - (On) but to the side - (On) a shape - (On) to the edge	7	21.875	-	-	0
55	In	- (In) the middle - Directly (in) the middle - (In) the centre	32	100	-	-	-	-	-	0
58	In	- (In) the middle	22	68.75	Between - A bit (between) the other shapes	8	25	-	-	2
82	In	-	28	87.5	Inside	4	12.5	-	-	0

The preposition 'in' was also assigned to some images in the Adult Instrument by some adult participants (Table 4.33). These responses were not the typical response given for these images but demonstrate the aspect of centrality (Figure 4.16). Generally there were supporting words used to clearly suggest centrality i.e. 'the middle', 'the centre'. This demonstrated that 'in' can be assigned to configuration of features where the faces of the central object are not fully shielded.

Table 4.33.

Adult participant responses of the images in the Adult Instrument assigned the preposition 'in' as a non typical response

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
6	Between	-	26	81.25	In - (In) The middle of	6	18.75	-	-	0
38	Between	-	20	62.5	Behind - (Behind) and to the side - (Behind) sort of	6	18.75	-	-	0
					In (In) the middle of the other two at the sides - (In) the middle - (In) the middle of the other shapes	6	18.75			
48	Above	- (Above) and slightly across - Sort of (above)	23	71.875	Behind - Almost (behind)	6	18.75	-	-	0
					In - (In) the centre	2	6.25			
					Up - (Up) from the other shape	1	3.125			
62	Between	-	17	53.125	In - (In) the middle of - (In) line with	14	43.75	Equal distance to the green and the blue	1	0
64	Behind	-	27	84.375	In - (In) line with	2	6.25	Centre	2	0
					Near	1	3.125			

Figure 4.16. Images in the Adult Instrument that participants assigned the preposition 'in' as a secondary response demonstrating centrality.

Nearly all the typical responses for the images selected to receive allocation of the preposition 'in' were where the preposition 'between' was also used as a typical response. The distance between the central object and the other two objects was obviously enough to encourage the participants to use the screen as a measure and assign the preposition 'in' meaning central to the viewing point as seen by the participant. This demonstrated the ability of adults to ignore other objects in view.

4.4.1.1 Adult responses compared and contrasted to the responses of children in the main study. All the images that the adult participants chose to assign the preposition 'in' included features of centrality and a degree of containment. Containment either by immersion or inclusion was a feature demonstrated by all children in the main study in response to the prompt 'in'. All 46 children age 5 to 6 years showing TLD selected an object and immersed it by placing it into the container. This could just have been a simple way for the children showing TLD to demonstrate the features of 'in'. The difference between the children age 5 to 6 years showing TLD and the children age 4 to 5 years showing TLD and the children with SLI age 5 to 6 years was that they did not centralise objects in response to the prompt 'in'. However, it was apparent that for many children age 4 to 5 years showing TLD and the children with SLI age 5 to 6 years this was a necessary feature. Two objects were always used by all the children in Stage 2 to configure the features for the preposition 'in'. The main difference between the features selected by the adult participants in the Adult Instrument related to the preposition 'in' in comparison to those demonstrated by children age 5 to 6

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years showing TLD, the children age 4 to 5 years showing TLD and the children with SLI age 5 to 6 years were that images showing collections of single objects seen to surround the referent object in the image could be used to create the sense of containment rather than a solid boundary and were described using the preposition 'in'. For adults contact was not a requisite feature for the preposition 'in' to be assigned.   Table 4.34 shows the mapping of semantic features for children 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years in response to the prompt 'in' and adult assignment of the preposition 'in' to images in the Adult Instrument.

Table 4.34.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'In' and Adult Assignment of the Preposition 'In'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years	Features in Adult Instrument Image assigned the preposition 'In'
Containment	+	+	+	+
Contact base	+	+	+	+ -
Horizontal contact	-	-	-	-
One other object	+	+	+	+ -
Two other objects	-	-	-	+ -
More than two objects	-	-	-	+ -
Centrality	-	+ -	+ -	+ -
90 degree angle	-	-	-	-
Sided one face of object	-	-	-	-
Sided one face of object & base	-	-	-	-
Sided two sides of object on opposite faces	-	-	-	+ -
Sided four sides of object	-	-	-	+ -
Sided all faces except one	+	+	+	+ -
Sided all faces	-	-	-	-
Horizontal plane	-	-	-	+ -
Projective plane	-	-	-	-
Vertical plane	-	-	-	-
Movement/path	-	-	-	-

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

4.4.2 On

Table 4.35 shows adult participant responses to the images in the Adult Instrument assigned the preposition 'On'. The preposition 'on' was always assigned to images of singular static objects and the location of the referent was always labeled.

Table 4.35.

Adult Participant Responses to the Images in the Adult Instrument Assigned the Preposition 'On'

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
10	On	- (On) the edge	32	100	-	-	-	-	-	0
21	On	- (On) the edge - Balanced (on) - (On) the edge but falling	32	100	-	-	-	-	-	0
23	On	- (On) the screen	21	65.625	-	-	-	- To the side - To the side of the screen	3 3	5
26	On	- (On) the floor	30	93.75	Near	2	6.25	-	-	0
35	On	- (On) top - (On) the centre top	10	31.25	In - (In) a bit At the top	5	15.625		-	0
41	On	- (On) the screen - (On) the other side of the screen	3	9.375	-	-	-	- Away from the other shape - Towards the edge of the screen - Is the other side	11 8 5	5
44	On	- (On) the screen	4	12.5	-	-	-	- Other side of the screen - Towards the edge of the screen - Side of the screen - Away from the other shape	6 6 5	11
45	On	-(On) the table	23	71.875	In - (In) the middle	9	28.125	-	-	0
50	On	- (On) top of - (On) top	32	100	-	-	-	-	-	0
80	On	- (On) the side	28	87.5	-	-		To the side	4	0

Many of the images selected by adult participants where 'on' was assigned demonstrated that possibly when no obvious relationship was observed between the objects within the image adults will use a referent which includes all the objects within it (Figure 4.17). Adults chose to use the screen or the edges of the screen to show position of the target object. This was in opposition to assigning an object within the image a prototypical or other relationship that maybe other participants had named.

Image 10: 'On' the edge   Image 21: 'On' the edge   Image 23: 'On' the screen

Image 26: 'On' the floor   Image 35: 'On' the top   Image 41: 'On' the screen

Image 44: 'On' the screen   Image 45: 'On' the table   Image 50: 'On' the top

Image 80: 'On' the screen
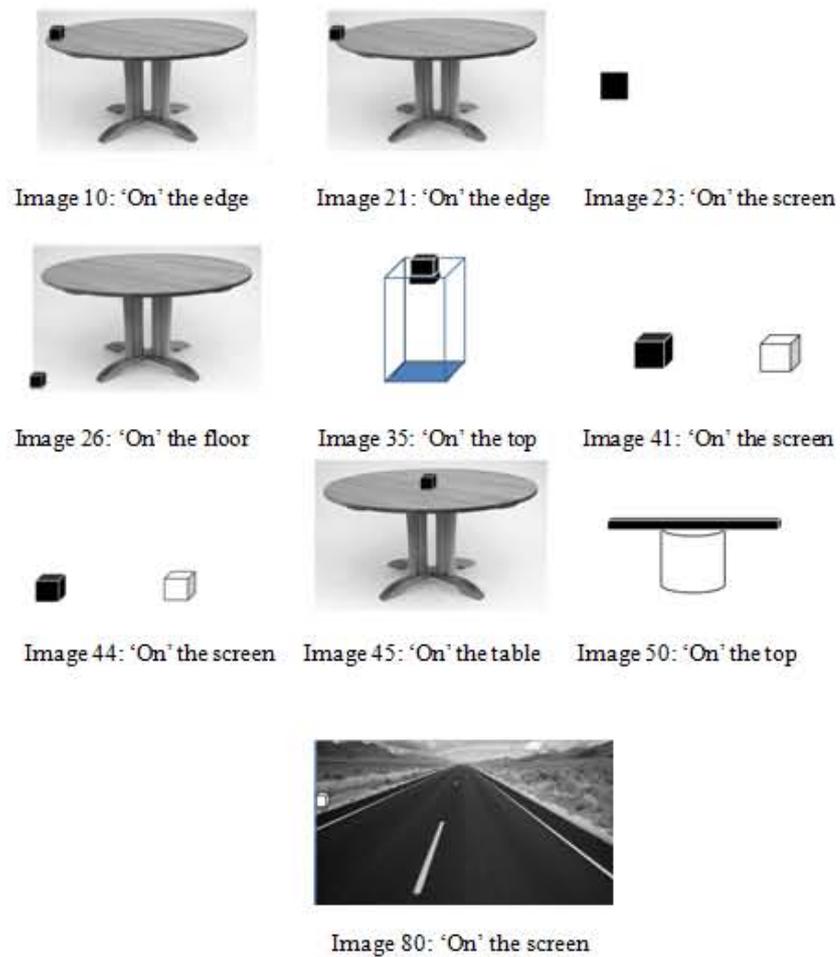
Figure 4.17. Images in the Adult Instrument that participants assigned the preposition 'on' demonstrating contact.

The preposition 'on' was also assigned to some images in the Adult Instrument by some adult participants but they were not the typical responses given for these images (Table 4.36).

Table 4.36.

Adult Participant Responses to the Images in the Adult Instrument Assigned the Preposition 'On' as a Non Typical Response

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
18	Under	- (Under) Bottom corner - (Under) at the corner	20	62.5	Underneath Below On - (On) the bottom	5 2 2	15.625 6.25 6.25	Supporting other shape	3	0
31	Inside	-	25	78.125	On - (On) but to the side - (On) a shape - (On) to the edge	7	21.875	-	-	0
36	Under	-	23	71.875	Underneath On - (On) the floor Near	5 3 1	15.625 9.375 3.125	-	-	0
42	Under	-	24	75	Underneath Below On -(On) the bottom	2 1 1	6.25 3.125 3.125	Supporting the other shape	4	0
68	In front	-	21	65.625	Above -(Above) the chair - (Above) the middle of the screen Behind On	5 3 3	15.625 9.375 9.375	-	-	0
81	Across	-	30	93.75	On - (On) the other side	2	6.25	-	-	0

There are images where other prepositions were assigned by the majority of adult participants but were ignored and the preposition 'on' has been assigned. These responses were not the typical response given for these images but still demonstrate the aspect of contact (Figure 4.18). The images where the typical response from adult participants was 'under' (Images 18 and 42) but were also assigned the preposition 'on' by some participants suggest that the feature of contact is highly sought when determining position of object.

Image 18: 'On' the bottom

Image 31: 'On' a shape, to the side, to the edge

Image 36: 'On' the floor

Image 42: 'On' the bottom

Image 68: 'On' the chair

Image 81: 'On' the other side (Animated slide where object moves from the left side of the screen to the right side of the screen)

Figure 4.18. Images assigned the preposition 'on' in the Adult Instrument that were non typical responses demonstrating contact between objects.

It also showed that for some adult participants the images where others had assigned the preposition 'under' was not totally convincing or seen as a good example of the associated features for this preposition. Slide 81 of the Adult Instrument was assigned the preposition 'on' but it was felt the 2 participants had given the final resting place for the object rather than describing movement.

4.4.2.1 Adult responses compared and contrasted to the responses of children in the main study. Similarities were evident between the features of the images selected by all adult participants and the configuration of objects by the children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and the children age 5 to 6 years with SLI participants. Centrality was not always a requisite for the prepositions 'in' and 'on' being assigned for the adult participants but this was not the case for the child participants in the main study. Contact was employed as a component of the preposition 'on'. All the children in the main study

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chose a flat base on which to support the object selected with most children selecting the thin level lid. This need for support was also observed in the images chosen by the adult participants that were selected from the Adult Instrument. In some instances this support was perhaps perceived as being more along the lines of the ability of the supporting object to accept attachment from the referent object in a way that defies gravity e.g. 'On' the screen'. This confirmed that a feature of the preposition 'on' was also the ability for the object selected to be functionally supported by a base rather than just having contact with the support object. Table 4.37 shows the mapping of semantic features for typically developing children 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years response to prompt 'on' and adult assignment of the preposition 'on'.

4.2.3 Concluding Comments Related to the Comparison of Semantic Features of Prepositions 'In' and On'

Fundamentally the typical features configured by children in Stage 2 in the main study in response to the prompt 'on' were seen in the images described and assigned the preposition 'on' by adult participants. However, adults were more flexible in their allowances to still describe objects in the images as 'on' even when objects were not centrally placed. The image of one object positioned on top of and in contact with another object (Slide 50), was included because it depicted the static configuration of two objects made by children in response to the prompt 'over'. Interestingly, this image was always described by adults as related to the preposition 'on'. Supporting words were nearly always used by adult participants e.g. "on top". These responses confirmed the essential component or feature of 'on' as being contact between objects.

Adult responses to images using 'on' and 'in' showed that containment, contact and central and non-central positioning of objects were accepted features of these prepositions. Images depicting inclusion showed that no shielding at all for the sides of the object being contained was also a feature of 'in' (Images 31 and 55). In response to the image showing the shape in the centre of the table (Images 45), 8 of the 32 adult participants stated that the "shape is 'in' the middle of the table". This demonstrates the very close relationship of semantic features related to the prepositions 'in' and 'on'.

Table 4.37.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'On' and Adult Assignment of the Preposition 'On'

Component	Children age 5 to 6 years showing TLD	Children age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years	Features in Adult Instrument Image assigned the preposition 'On'
Containment	-	-	-	-
Contact base	+	+	+	+
Horizontal contact	-	-	-	-
One other object	+	+	+	+
Two other objects	-	-	-	-
More than two objects	-	-	-	-
Centrality	+	+	+	+ -
90 degree angle	-	-	-	-
Sided one face of object	-	-	-	-
Sided one face of object & base	-	-	-	-
Sided two sides of object on opposite faces	-	-	-	-
Sided four sides of object	-	-	-	-
Sided all faces except one	-	-	-	-
Sided all faces	-	-	-	-
Horizontal plane	-	-	-	-
Projective plane	-	-	-	-
Vertical plane	-	-	-	-
Movement/path	-	-	-	-

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

4.4.4 Under

Collectively the images designed to discover adult understandings related to 'under' included features of contact and complete covering of the whole object by another object or how much of an object needed to be covered to deem the object 'under' another object (Table 4.38). The preposition 'underneath' was also assigned by adults as an alternative to using 'under' when the criteria for the semantic features seen in other typical responses from adult participants for the prepostion 'under' were met. Adults showed that neither complete covering of the object below another, centrality or contact were required features in order to describe the relationship of one object to another as 'under' (Figure 4.19). Some images in the Adult Instrument were designed to examine how far away from the object above another can be from the object underneath or in close proximity and still be assigned the preposition 'under' by adult participants. These images can be seen in Figure 4.20. These objects that were not directly under and within the sides of the object above received either no responses therefore stating that no relationship could be identified or the preposition 'below' or 'near' was used (Figure 4.20). Often this was used in conjuction with supporting phrases ["below but further away" Participant 16. Adult Instrument]. Only 2 adult partcipants assigned the preposition 'under' to image 30 of the Adult Instrument but did so together with offering supporting words ["Under towards the side" Participant 3. Adult Instrument]. ["Under but to the side" Participant 8. Adult Instrument]. Therefore for the preposition 'under' to be assigned to configurations of objects seen in the images at least some of the target object needs to be directly under or shielded by the object above. Some adults are still willing to assign the presposition 'under' to configuration of objects if the object underneath is seen to be in line with the edge of the object above as seen in the Adult Instrument image 30 (See Figure 4.20). 'Beneath' was also used and occasionally the preposition 'below'.

The prepositions 'below' was assigned to a variety of configuarations of objects showing cover but no contact, cover but distance between objects and no cover (Figure 4.21). The images seen in Figure 4. showed that features of 'below' constitute objects positioned at a lower vertical plane than the object directly above regardless of whether contact is made or if the object above covers all of the top face of the object underneath. This is contrast to the features for the preposition 'under' where some covering of the lower object must be apparent.

Table 4.38.

Adult Participant Responses of the Images in the Adult Instrument Assigned the Preposition 'Under'

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
18	Under	- (Under) Bottom corner - (Under) at the corner	20	62.5	Underneath Below On - (On) the bottom	5 2 2	15.625 6.25 6.25	Supporting other shape	3	0
36	Under	-	23	71.875	Underneath On - (On) the floor Near	5 3 1	15.625 9.375 3.125	-	-	0
42	Under	-	24	75	Underneath Below On	2 1 1	6.25 3.125 3.125	Supporting the other shape	4	0
66	Under	- (Under) holding up the shape	18	56.25	Underneath - (Underneath) the middle Beneath	10	31.25	- Supported centre - Balancing - Holding up the shape	1 1 2	0
74	Under	-	28	87.5	-	-	-	- Supporting the other shape - Holding up the other shape	3 1	0

Image 18: 'Under'   Image 36: 'Under'   Image 42: 'Under'

Image 66: 'Under'   Image 74: 'Under'

Figure 4.19. Images in the Adult Instrument that participants assigned the preposition 'under'.

Image 22: 'Below' or 'in front'   Image 26: 'On' or 'near'

Image 30: 'Below' or 'near' or 'under'

Figure 4.20. Adult Instrument images designed to examine how far away from the object above another can be from the object underneath or in close proximity and still be assigned the preposition 'under' showing actual adult responses.

Image 7: 'Below'   Image 47: 'Below'
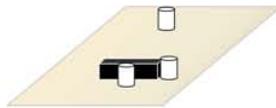
Image 53: 'Behind, 'below'   Image 67: 'Below' and over a bit
and 'next to'
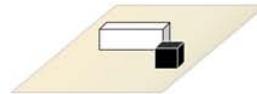
Figure 4.21. Images in the Adult Instrument that participants assigned the preposition 'below'.

Table 4.39.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years Response to Prompt 'Under' and Adult Assignment of the Preposition 'Under'

Component	Children Age 5 to 6 years showing TLD	Children Age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years	Features in Adult Instrument Image assigned the preposition 'Under'
Containment	+ -	+ -	+ -	-
Contact Base	+ -	+ -	+ -	+ -
Horizontal Contact	-	-	-	-
One other object	+	+ -	+	+
Two other objects	-	-	-	-
More than two objects	-	+ -	-	-
Centrality	+ -	+ -	+ -	+ -
90 degree angle	-	-	-	-
Sided one face of object	-	-	-	-
Sided one face of object & base	-	-	-	+
Sided two sides of object on opposite faces	+ -	+ -	+ -	+
Sided four sides of object	-	-	-	-
Sided all faces except one	-	-	-	-
Sided all faces	+ -	+ -	+ -	-
Horizontal plane	-	-	-	-
Projective plane	-	-	-	-
Vertical Plane	+	+	+	+
Movement/path	-	-	-	-

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

4.4.4.1 Adult responses compared and contrasted to the responses of children in the main study. Contact with a base and the upper face (opposite faces) of the selected object was a prominent feature in the responses to the prompt 'under' by the children in the main study and this component was nearly always observed in children age 5 to 6 years showing TLD. Contact was not always required to be included in the configuration of objects seen in the images of the Adult Instrument for the preposition 'under' to be used. Centrality was judged to be a component of the features observed in the children's configurations but evidence was not totally persuasive that it was an essential feature of the preposition 'under'. Adult selection of images to assign the preposition 'under' showed that adults do not require objects to be centrally placed. Table 4.39 shows the features used by children age 4 to 5 years showing TLD, children age 5 to 6 years showing TLD and adults. There was a positive response to the feature 'one side of the object and the base' this is because adults selected images that showed one static object suspended above the other and the preposition 'under' was assigned. Children did not choose to hold one object directly over above another when they configured objects in response to the prompt 'under' demonstrated by children. While there are similarities in the features demonstrated by children in their configurations and those images selected by adults differences are that adults are willing to accept just some of the object directly under another object placed above as children are not.

4.4.5 Over

The only time 'over' was included in the written responses from adults was in response to image 71 of the Adult Instrument when vertical movement was witnessed with one animated object moving vertically from one side to the other of a static object (Table 4.40). The image shows the object moving over the static object but it cannot be concluded that adults include centrality as a feature for the preposition 'over' (Figure 4.22). This has been recorded as a negative for centrality in Table 4.32. Although the feature was seen in the data collected in this study it is accepted that this component would need further investigation to assign certainty of centrality as a component always required for the preposition 'over'. Adults used the word 'over' to describe image 71 without using support words. This matched the typical response from children showing TLD and children with SLI suggesting that this is an accepted configuration of objects related to the preposition 'over'.

Table 4.40.

Adult Participant Responses of the Images in the Adult Instrument Assigned the Preposition 'Over'

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
71	Over	-	21	65.625	Around - (Around) part of the way - (Around) some of the shape	9	28.125	Semi circle movement	1	1

4.4.5.1 Adult responses compared and contrasted to the responses of children in the main study. All children in the main study who responded to the prompt 'over' used two objects in their configurations. Static placements of objects configured with one object over the other included contact and non-contact with the children holding the object selected above another object. This was not a feature seen in the image selected by adults (Table 4.41). The image in the Adult Instrument designed to explore adult assignment of the preposition 'over' that showed static placement of one object over another (Adult Instrument Slide 50 – See Figure 4.22) proved to elicit responses of 'on' as contact was made between objects. This was in direct contrast to the configurations demonstrated by some children in response to the prompt 'over' who placed one object across the upper face of another object. The images in the Adult Instrument showing essentially a static object suspended vertically and centrally over another achieved responses of 'above' from all adult participants.
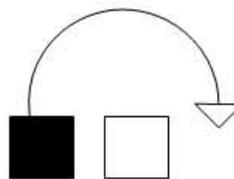
Figure 4.22. Image in the Adult Instrument assigned the preposition 'over' (Animated image where the object to the left of screen moves in a vertical plane from one side of the static object to the other).

Table 4.41.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Over' and Adult Assignment of the Preposition 'Over'

Component	Children Age 5 to 6 years showing TLD	Children Age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years	Features in Adult Instrument Image assigned the preposition 'Over'
Containment	-	-	+ -	-
Contact Base	+ -	+ -	+ -	-
Horizontal Contact	-	-	+ -	-
One other object	+	+	+	+
Two other objects	-	-	-	-
More than two objects	-	-	-	-
Centrality	+	+ -	+ -	-
90 degree angle	-	-	-	-
Sided one face of object	+ -	+ -	+ -	-
Sided one face of object & base	-	-	+ -	-
Sided two sides of object on opposite faces	-	-	-	-
Sided four sides of object	-	-	-	-
Sided all faces except one	-	-	-	-
Sided all faces	-	-	+ -	-
Horizontal plane	-	-	+ -	-
Projective plane	-	-	-	-
Vertical Plane	+	+	+ -	+
Movement/path	+ -	+ -	+ -	+

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

4.4.6 Around

Adults identified images using the preposition 'around' that included two objects and where there was movement (Table 4.42). Adults selected the images in the Adult Instrument that showed movement of either 360 degree or 270 degree circumnavigation of one object around another (Figure 4.23). There was no difference in the responses related to the direction of the movement. One image was included that contained static objects encircling one central static object as this was a configuration demonstrated by a few of the children 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years in the main study in response to the prompt 'around' (Figure 4.30). Adults did not identify the preposition 'around' with this image.

Table 4.42.

Adult Participant Responses of the Images in the Adult Instrument Assigned the Preposition 'Around'

| Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
12	Around	-	29	90.625	-	-	-	Circled	3	0
16	Around	-	30	93.75	-	-	-	- ¾ way	1	0
								- Enveloped	1	
60	Around	- (Around) halfway - (Around) some of the way	32	100	-	-	-	-	-	0

Image 12: 'Around' (Animated image 360 degree movement from left to right)
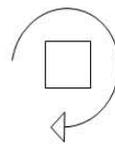
Image 16: 'Around' (Animated image 270 degree movement from left to right)
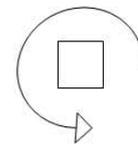
Image 60: 'Around' (Animated image 270 degree movement from right to left)

Figure 4.23. Images in the Adult Instrument that participants typically assigned the preposition 'around'.

4.4.6.1 Adult responses compared and contrasted to the responses of children in the main study. Adult responses showed that a central feature of the preposition 'around' was always movement of one object circling another (See Table 4.43). The circumnavigation did not need to completely encase the centrally placed static object and direction of the movement was not relevant. The children 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years in the main study generally chose to select one object and move the object rather than make static placements. There was very little difference in the types of configurations made among all children in the main study who responded with most choosing to circumnavigate one object 360 degrees around another. There were one or two children from each group in the main study who made static placements of objects and chose to surround one object with other objects or who selected one object and then turned it spun it in their hands. Adults did not assign the preposition 'around' to static objects that encircle another centrally placed object (Figure 4.24).
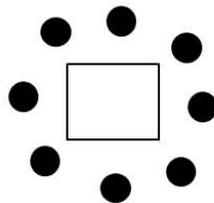
Figure 4.24. Image in the Adult Instrument that participants assigned the word 'surround'.

Table 4.43.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Around' and Adult Assignment of the Preposition 'Around'

Component	Children Age 5 to 6 years showing TLD	Children Age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years	Features in Adult Instrument Image assigned the preposition 'around'
Containment	-	+ -	+ -	-
Contact Base	+ -	+ -	+ -	+
Horizontal Contact	+ -	+ -	+ -	-
One other object	+ -	+ -	+ -	+
Two other objects	-	-	-	-
More than two objects	+ -	+ -	+ -	-
Centrality	+ -	+	+	+
90 degree angle	-	-	-	-
Sided one face of object	-	-	-	-
Sided one face of object & base	-	-	-	+
Sided two sides of object on opposite faces	-	-	-	-
Sided four sides of object	-	-	-	-
Sided all faces except one	+ -	+ -	+ -	-
Sided all faces	-	-	-	-
Horizontal plane	-	-	-	-
Projective plane	-	-	-	-
Vertical Plane	-	-	-	-
Movement/path	+ -	+ -	+ -	+

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

4.4.7 Across

Adults assigned the preposition 'across' to objects that moved horizontally from one side of the screen to the other (Table 4.44). Across was examined by providing two images both showing movement from left to right of the screen (Figure 4.25). One image held no connotations to functional use of objects and did not have a base. One image included a road to determine if a base was needed for the movement of the shape to be demenstrative of the features of the preposition 'across'. Responses showed that a base was not always necessary as a feature for the preposition 'across'. However, responses were increased when a base was provided.

4.4.7.1 Adult responses compared and contrasted to the responses of children in the main study. Adult participants selected those images included in the Adult Instrument that showed horizontal movement of one object from one side of the screen to another. Contact was not needed as a feature for assigning the preposition 'across'. Essentially there was very little difference in the types of features demonstrated between any of the groups of children in the main study and those of adults. Table 4.45 shows the mapping of semantic features for children 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years response to prompt 'across' and adult assignment of the preposition 'across'.

Table 4.44.

Adult Participant Responses of the Images in the Adult Instrument Assigned the Preposition 'Across'

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
24	Across	- Moves (across)	27	84.375	-	-	-	Moves to the other side	5	0
81	Across	-	30	93.75	On - (On) the other side	2	6.25	-	-	0

Image 24: Animated image 'Across' (Object moves from one side of the screen to the other from left to right).

Image 81: Animated image 'Across' (Object moves from one side of the screen to the other from left to right).

Figure 4.25. Images in the Adult Instrument that participants typically assigned the preposition 'across'.

The majority of children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years who responded from each of the groups demonstrated features including movement along a horizontal plane. There was either left to right or right to left movement and contact the surface of the table was not always observed. There were substantially more children from each of the groups of children showing TLD than the children with SLI age 5 to 6 years who used two objects in their demonstrations moving one object centrally over another from one side to another. Adults showed that movement was always a required feature to constitute assigning the preposition 'across' but contact was not always necessary. There were a few children in each of the main study groups that chose to configure objects using a non-typical response but the configuration selected by adults aligns with the features demonstrated by the majority response by children age 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years to the prompt 'across'. Adult responses are similar to children's responses who demonstrated that a horizontal plane and movement of the object selected were the dominate features for determining 'across'.

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Table 4.45.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Across' and Adult Assignment of the Preposition 'Across'

Component	Children Age 5 to 6 years showing TLD	Children Age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years	Features in Adult Instrument Image assigned the preposition 'across'
Containment	-	-	-	-
Contact Base	+ -	+ -	+ -	+ -
Horizontal Contact	+ -	-	+ -	-
One other object	+ -	+ -	+ -	+
Two other objects	-	-	-	-
More than two objects	+ -	-	-	-
Centrality	+ -	+ -	+ -	-
90 degree angle	-	-	+ -	-
Sided one face of object	-	-	-	-
Sided one face of object & base	-	-	+ -	-
Sided two sides of object on opposite faces	+ -	-	+ -	-
Sided four sides of object	-	-	-	-
Sided all faces except one	-	-	-	-
Sided all faces	-	-	-	-
Horizontal plane	-	-	-	+
Projective plane	-	-	+ -	-
Vertical plane	-	+ -	-	-
Movement/path	+ -	+ -	+ -	+

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

4.4.8 In Front and Behind

4.4.8.1 In front and behind. Shapes with no obvious fronts or faces or non-fronted objects positioned on a projective plane were included in the Adult Instrument images. Adult participants always described the space between the image of the object and self as being 'in front' and the central location on the far side of the object was interpreted as 'behind' (Table 4.46). Although children were not provided with fronted objects or objects with obvious fronts or faces in the main study, providing fronted objects to adults allowed this aspect to be investigated. An image of an object with an obvious front was included in the images of the Adult Instument. This was the high backed chair in slides 39 and 68 of the Adult Instrument.

Fronting was observed as including an object with a defined front and back affected the description or the preposition used by the adult participants (Table 4.47).   This demonstrated adult understanding of using a front or back of a known object and using this knowledge to describe the position of the shape in relation to it. This occurred in 75 % of descriptions when an object was positioned to the back of a fronted object or between the viewer and the referent. A few adult participants still choose to describe the position of objects in the images in relation to intrinsic reference ignoring the object features.

Table 4.46.

Adult Participants Responses to the images in the Adult Instrument using Non Fronted Objects

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
9	In front	-	32	100	-	-	-	-	-	0
43	Behind	-	32	100	-	-	-	-	-	0

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Table 4.47.

Adult Participants Responses to the Images in the Adult Instrument using a Fronted Object

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
39	Behind	-	24	75	In front	8	25	-	-	0
68	In front	-	21	65.635	Above - (Above) the chair - (Above) the middle of the screen	5	15.625	-	-	0
					Behind	3	9.375	-	-	-
					On	3	9.375	-	-	-

Slide 51 of the Adult Instrument was designed to determine notions of projective proximity but also served to produce some responses of 'above' from approximately 50 % of adults. If adults did this they also offered other supportive phrases to define descriptions ["above and approaching the other shape" Participant 26. Adult Instrument]. ["Sits away from the centre above the other object" Participant 12. Adult Instrument]. Table 4.48 shows the mapping of semantic features for children 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years response to prompt 'in front' and 'behind' together with adult assignment of the preposition 'in front' and 'behind'.

Table 4.48.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'In front' and 'Behind' Together with Adult Assignment of the Preposition 'In front' and 'Behind'

Component	Children age 5 to 6 Years showing TLD response to prompt 'in front'	Children age 4 to 5 years showing TLD response to prompt 'in front'	Children with SLI age 5 to 6 years response to prompt 'in front'	Children age 5 to 6 years showing TLD response to prompt 'behind'	Children age 4 to 5 years showing TLD response to prompt 'behind'	Children with SLI age 5 to 6 years response to prompt 'behind'	Features in Adult Instrument Image assigned the preposition 'In front'	Features in Adult Instrument Image assigned the preposition 'Behind'
Containment	-	-	-	-	-	-	-	-
Contact Base	+	+	+	+	+	+	+	+
Horizontal Contact	+ -	+ -	+ -	+ -	+ -	+ -	-	-
One other object	+	+	+	+	+	+	+	+
Two other objects	-	-	-	-	-	-	-	-
More than two objects	-	-	-	-	-	-	-	-
Centrality	+ -	+ -	+ -	+ -	+ -	+ -	-	-
90 degree angle	+ -	+ -	+ -	+ -	+ -	+ -	-	-
Sided one face of object	-	-	-	-	-	-	-	-
Sided one face of object & base	+ -	+ -	+ -	+ -	+ -	+ -	+	+
Sided two sides of object on opposite faces	-	-	-	-	-	-	-	-
Sided four sides of object	-	-	-	-	-	-	-	-
Sided all faces except one	-	-	-	-	-	-	-	-
Sided all faces	-	-	-	-	-	-	-	-
Horizontal plane	+ -	+ -	+ -	+ -	+ -	+ -	-	-
Projective plane	+ -	+ -	+ -	+ -	+ -	+ -	+	+
Vertical Plane	+ -	+ -	+ -	+ -	+ -	+ -	-	-
Movement/ path	-	-	-	-	-	-	-	-

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

4.4.8.2 Next to. Adults always used 'next to' to describe configurations if the object in the images of the Adult Instrument were 90 degrees centrally adjacent to the left or the right of another object. No other supporting information was given when describing objects in these left or right configurations. Table 4.49 shows the adult participant responses to images of objects placed centrally adjacent and at a 90 degree angle as viewed by the participant. Together with the response of next to' adults also used 'beside' and 'alongside' to describe the position of the objects in the images. However adults are able to tolerate the movement of an object away from the 90 degree centrally adjacent positioning and still use the preposition 'next to' by adding additional language or supporting words to make the descriptions more explicit. There was some use of the prepositions 'above', 'beside' and 'alongside' in responses which were not target prepositions.

Distance between objects centrally adjacent and at a 90 degree angle is also a feature of the preposition 'next to'. Images 1, 29, 32, 37, 41 and 44 were designed to examine if the amount of distance between objects affected the assignment of the preposition 'next to' to the image (Appendix K). Responses to the images demonstrated that the further away the two objects became along a horizontal plane the less likely it was that adults would describe objects as 'next to'. If too much distance was deemed to be between objects adults may not have seen a relationship and gave no response. Adult understandings of the features related to the preposition 'next to' were the same as seen in those children who also configured objects at a 90 degree angle (Table 4.49).

Table 4.49.

Adult Participant Responses of the Images in the Adult Instrument Assigned the Preposition 'Next to'

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
1	Next to	-	22	68.75	Beside	10	31.25	-		0
25	Next to	-	30	93.75	-	-	-	Along side	2	0
29	Next to	-	29	90.625	Beside	3	9.375	-	-	0
65	Next to	- (Next to) but not touching	24	75	Beside	8	25	-	-	0

Table 4.50.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Next to' and Adult Assignment of the Preposition 'Next to'

Component	Children Age 5 to 6 years showing TLD	Children Age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years	Features in Adult Instrument Image assigned the preposition 'Next to'
Containment	-	+/-	+/-	-
Contact Base	+	+/-	+	+
Horizontal Contact	+/-	-	-	+/-
One other object	+	+/-	+	+
Two other objects	-	-	-	-
More than two objects	-	+/-	-	-
Centrality	+	+/-	+/-	+/-
90 degree angle	+	-	-	+/-
Sided one face of object	-	-	-	-
Sided one face of object & base	+	-	-	+
Sided two sides of object on opposite faces	-	+/-	+/-	–
Sided four sides of object	-	-	-	–
Sided all faces except one	-	-	-	–
Sided all faces	-	+/-	+/-	–
Horizontal Plane	-	-	-	–
Projective plane	+/-	+/-	+/-	-
Vertical Plane	-	-	-	-
Movement/path	-	-	-	-

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

4.4.8.3 Adult use of the prepositions 'in front', 'behind' and 'next to'.
Together with specific use of the prepositions 'in front', 'behind' and 'next to' in relation to object position, when plotting the responses it can be seen that adults used these prespositions when objects are centrally placed in relation to a face of another object (Figure 4.26). There were defined areas where the prepositions was assigned to object placement as identified in Figure 4.27. In the case of 'in front' the object needed to be positioned centrally between the viewer and the object. For the preposition 'behind' to be used the object needed to be placed centrally adjacent using a projective plane objectively to the properties of a reference point. "Next to' was assigned if the object was centrally placed at a 90 degree angle as viewed by the participant. As the placement of the object in the images moved from defined placements and began to migrate into less defined areas adult participants still used the prepositions 'in front', 'behind' and 'next to' but they also offered more descriptive words that served to support the preposition word and make descriptions of position clearer (Figure 4.28 and Table 4.51).
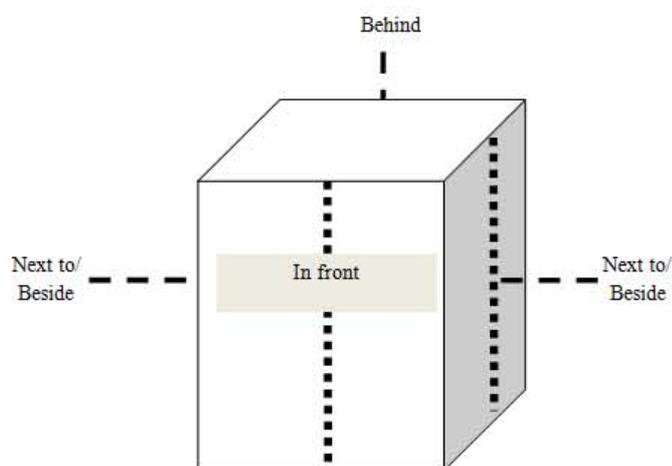
Figure 4.26. Adult use of 'in front', 'behind' and 'next to' in the Adult Instrument showing defined central positions as viewed by the adult participant.
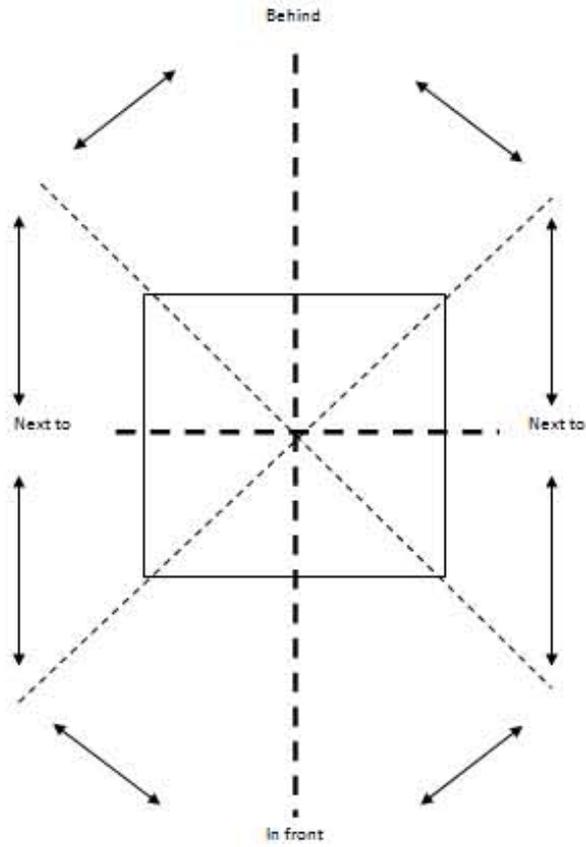
Figure 4.27. Adult understanding of position related to 'in front', 'behind' and 'next to' as demonstrated by responses in the Adult Instrument (Aerial view) as viewed by the adult participant.
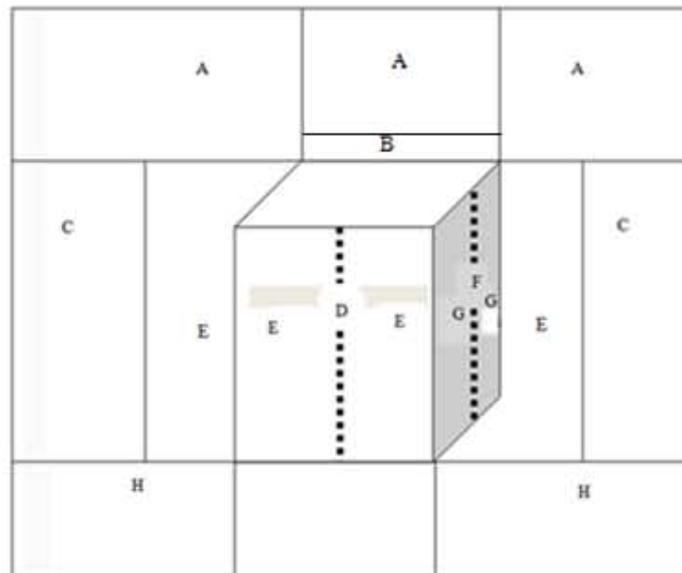
Figure 4.28. Sections to differentiate the location of objects in the images of the Adult Instrument and the responses of prepositions 'in front', (D) 'behind' (B) and 'next to' (F) and sections showing placement of objects where supporting words were given (A, C, D, E, G, H) as viewed by the adult participant.

Table 4.51.
Adult Use of Prepositions 'In Front, 'Behind' and 'Next To' Supporting Words Used in the Final Adult Instrument in Relation to the Sections Shown in Figure 4.25

Section of Figure 4.	Supporting words
A	Above
	To the top
	Top
	Sort of at the top
B	Behind
C	Next to
	Beside
	Near
	At the side
	To the side
	A bit apart
	Further away
	Adjacent
D	In front
E	Almost at the front
	Towards the front
	A bit at the front
F	At the side
	To the side
	Bit to the side
G	Next to
H	Away from
	Further from
	Near
	Set forward/s
	At the corner
	Other side of
	Over a bit

4.4.8.4 Adult responses compared and contrasted to the responses of children in the main study. Twice as many children age 5 to 6 showing TLD compared to children with SLI age 5 to 6 years configured objects symmetrically using a projective plane. This meant an object was placed in the space between themselves and the reference point to demonstrate 'in front' and an object placed objectively to the properties of a reference point in response to the prompt 'behind' together with a 90 degree angle for the object placed and viewed by the participant to demonstrate 'next to'. Adults showed that a symmetrical projective plane was the typical configuration of objects in images selected where 'the prepositions 'in front' and 'behind' were assigned. All adults selected a projective plane with an object placed in the space between themselves and the reference point to demonstrate 'in front' and an object placed objectively to the properties of a reference point in

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response to the prompt 'behind'. This was also seen in the majority of configurations by children age 5 to 6 years showing TLD. Adults always assigned the preposition 'next to' to images depicting an object at a 90 degree angle as viewed by the participant. When images showed objects in non-typical placement adult participants still used the prepositions 'in front', 'behind' and 'next to' but they also offered more explanatory words.

4.4.9 Between

Adults assigned the preposition 'between' to some images included in the Adult Instrument but responses were less than the typical response for that image (Table 4.52). The preposition was used alone to describe some configurations of objects and as secondary support for a more prominent preposition to enable more explicit detail of the position of an object to be given. The preposition 'between' was also used as the main preposition by the adult participants in response to a variety of images in the Adult Instrument (Table 4.53)

Table 4.52.

Adult Participant Responses to the Images in the Adult Instrument Where Non Typical Response of 'Between' was Assigned

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of Response	Other responses	Number of non preposition responses	No response
58	In	- (In) the middle	22	86.75	Between - A bit (between) the other shapes	8	25	-	-	2
69	Behind	- (Behind) the others	19	59.375	In - (In) the background - (In) the middle Between Above - (Above) halfway	5 3 1	15.625 9.375 3.125	- Away from - At the rear - Equal distance from	2 1 1	0

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Table 4.53.

Adult Participant Responses of the Images in the Adult Instrument Assigned the Preposition 'Between'

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of Response	Non preposition responses	Number of non preposition responses	No response
3	Between	-	30	93.75	-	-	-	- Past the other two - A bit at the back	1 1	0
6	Between	-	26	81.25	In - (In) The middle of	6	18.75	-	-	0
13	Between	-	32	100	-	-	-	-	-	0
33	Between	-	32	100	-	-	-	-	-	0
38	Between	-	20	62.5	Behind - (Behind) and to the side - (Behind) sort of	6	18.75	-	-	0
					In (In) the middle of the other two at the sides - (In) the middle - (In) the middle of the other shapes	6	18.75			
49	Between	-	32	100	-	-	-	-	-	0
62	Between	-	17	53.125	In - (In) the middle of - (In) line with	14	43.75	Equal distance to the green and the blue	1	0
77	Between	-	31	96.875	-	-	-	Moves towards the middle of the two objects	1	0

Adults demonstrated that the features of the preposition 'between' can include a horizontal or a projective configuration of three objects together with symmetrical or non-symmetrical placement (Figure 4.29). Movement or path between two other stationary objects was also a feature. Movement was not seen in any of the configurations of objects in response to the prompt 'between' by children in the main study. Distance between the three objects was not a consideration providing other objects in the vicinity were not in prototypical positions known for other prepositions.
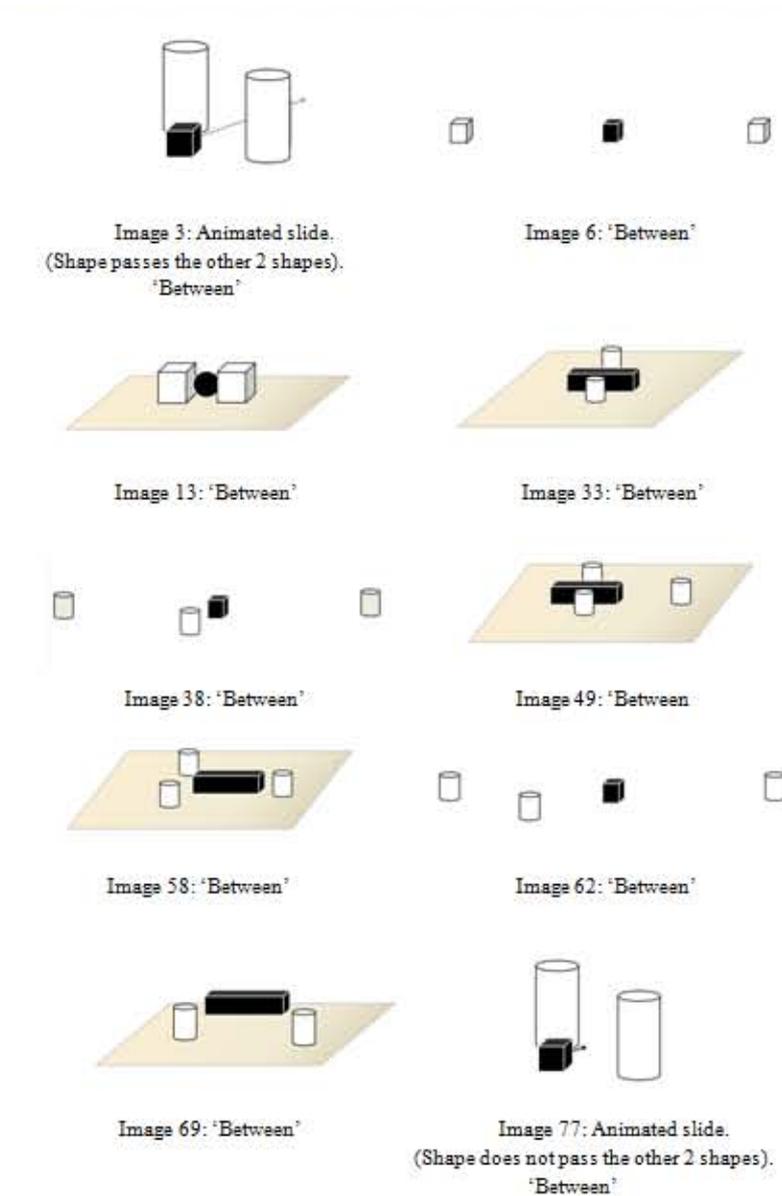
Figure 4.29. Images in the Adult Instrument that participants assigned the preposition 'between' demonstrating horizontal and vertical plane together with and without symmetrical placement and movement

The preposition word 'between' was used alone without other supporting phrases in some responses but only to support the description of an image where a projective plane preposition was already given (Table 4.54). This demonstrated showed that for adults alignment of the three objects was also not a necessary in order to use the preposition 'between' as long as another prototypical preposition or relationship has been stated (Figure 4.30).

Table 4.54.

Images in the Adult Instrument Assigned the Preposition 'Between' as a Supporting Description to a Prototypical Vertical Plane Preposition

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
40	In front and between	-	22	68.75	Below - (Below) others in the foreground	2	6.25	Surrounded by other shapes	8	0
57	In front	-	18	56.25	In front and between	8	25	Centre of the screen	4	0
					Below and between	2	6.25			

Adults also demonstrated that the preposition 'between' can be utilised to describe objects that are essentially surrounded or partially surrounded. This configuration was tantamount to creating an inclusive barrier around the central object by the other objects. Perhaps stating that an object was 'between' a small collection of other objects was a strategy to avoid lengthy descriptions. Adults have a sophisticated application of the features of the preposition 'between' in that it can be used to describe static horizontal or projective placement of three objects, symmetrical or non-symmetrical placed and movement.

4.4.9.1 Adult responses compared and contrasted to the responses of children in the main study. The images selected by adults where they chose to assign the preposition 'between' were quite diverse. There were some similarities between the features in the images that the adult selected and those configured using objects by the TLD children in the main study. Adults selected images depicting three objects positioned along a horizontal plane and a 90 degree placement and assigned the preposition 'between'. Almost a third of the TLD children age 4 to 5 years and nearly half the TLD 5 to 6 years in each group responded and used three objects configuring them using a horizontal plane and 90 degree placement.

Image 40: 'In front' and 'between'   Image 57: 'Below' and 'between'
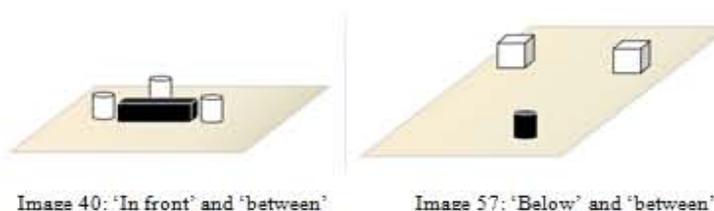
Figure 4.30. Images in the Adult Instrument that participants assigned the preposition 'between' as a supportive description where a projective plane preposition was first listed in the response.

Symmetry was also an identified component. This is recorded in Table 4.55 as the semantic feature 'Sided two sides of object on opposite faces'. Most children in Stage 2 selected two identical objects to be either side of the central object in their configurations and positioned them so that opposite sides of the central object were shielded by outer objects. In comparing the configurations of objects by the children with SLI almost half the children with SLI age 5 to 6 years who responded to the prompt 'between' only used two objects placing one object centrally adjacent to one other object using a horizontal plane. This showed that the children age 5 to 6 years showing TLD configured objects in a similar fashion to those images selected by adults who assigned the preposition 'between'. Interestingly adults are able to use this sense of symmetry together with the ability to identify with different perspectives of the configuration of features related to the preposition 'between'. In examining the adult data related to the preposition 'between' the ability of adults to retain a central feature of the preposition but manipulate and rotate it is especially apparent. Therefore, adults were able to tolerate the rotation of a set of three objects to a projective plane and still consider the objects to demonstrate configuration of the features of the preposition 'between. It can be concluded that a prominent feature of the preposition 'between' for adults was the configuration of three objects that were in line at a 180 degree angle or almost in line with each other at any angle.

One feature not seen used in the configurations by any of the children in the main study in response to the prompt 'between' was that of movement. Adults selected images of one object moving from one side of the space between two static objects past the inner faces of the objects to the other side. Adults assigned the preposition 'between' even when the three objects seen in the image only fleetingly achieved a symmetrical position and a straight 180 degree angle as the central object passed the other two. Adults also assigned the preposition 'between' even if the object stopped in the centre of other two objects and did not pass them.

Table 4.55.

Mapping of Semantic Features for Children Age 5 to 6 Years showing Typical Language Development Children Age 4 to 5 Years showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Between' and Adult Assignment of the Preposition 'Between'

Component	Children age 5 to 6 yrs showing TLD	Children age 4 to 5 yrs showing TLD	Children with SLI age 5 to 6 yrs	Features in Adult Instrument Image assigned the preposition 'between'
Containment	+ -	+ -	+ -	-
Contact Base	+	+	+	+
Horizontal Contact	+ -	+ -	+	-
One other object	+ -	+ -	+ -	-
Two other objects	+ -	+ -	+ -	+ -
More than two objects	-	-	-	+ -
Centrality	+ -	+ -	+ -	+ -
90 degree angle	+ -	+ -	+ -	-
Sided one face of object	-	-	-	-
Sided one face of object & base	+ -	+ -	+ -	-
Sided two sides of object on opposite faces	+ -	+ -	+ -	+
Sided four sides of object	-	-	-	-
Sided all faces except one	+ -	+ -	+ -	+ -
Sided all faces	-	-	-	-
Horizontal plane	+	+	+ -	+ -
Projective plane	-	-	-	+ -
Vertical plane	-	-	-	-
Movement/path	-	-	-	+ -

Note. In interpreting the feature analysis tables a minus symbol (–) denotes that the feature was not demonstrated by any child in the main study when the preposition prompt was given or in the selection of images by adult participant. A plus symbol (+) denotes that the feature was always demonstrated by every child in the main study when the preposition prompt was given or in the selection of images by adult participant. Often features were demonstrated by some participants but not others. A plus (+) and minus (–) together in the same section denote that the feature was demonstrated by some but not all participants so considered a feature for this preposition.

Table 4.56.

Adult Participant Responses of the Images in the Adult Instrument Assigned the Preposition 'Through'

Adult Instrument Image	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage of response	Non preposition responses	Number of non preposition responses	No response
28	Through	-	32	100	-	-	-	-	-	0

4.4.10 Through

The preposition 'through' was assigned to one just image in the Adult Instrument (Table 4.47). Movement was therefore a feature of the preposition 'through'. The features associated with 'through' meant that one object needed to be inserted into another object so that the outer sides of the moving object were shielded and then open as the object leaves the insertion boundary. There was a component of partial containment as the object was inserted into the boundary and four faces of it (vertical faces top and bottom and opposite horizontal faces) were momentarily shielded.

4.4.10.1 Adult responses compared and contrasted to the responses of children in the main study. All adults assigned the preposition 'through' to the image of one object moving inside a boundary and passing to the other side as demonstrated in Figure 4.31. A complete overview of the features in the images where adult participants assigned the preposition 'through' compared and contrasted to the features of the responses of children 5 to 6 years showing TLD, children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years can be seen in Table 4.57. More than 60 % (28 participants) of children age 5 to 6 years showing TLD in the main study selected one object and while holding it inserted it through the opening in the hoop from one side to another. Eighteen participants (30 % of all the children age 4 to 5years showing TLD) selected one object and inserted it through the opening in the hoop and moving it from one side to the other side. Nine children (36 %) with SLI children age 5 to 6 years selected one object and pushed it through the hoop from one side to the other of the hoop. A greater percentage of static configurations were more prominently observed in the children with SLI age 5 to 6 years who responded than in the children showing TLD who responded.

The trend for children showing TLD appears to be one of progression towards a prototypical configuration for the preposition 'through' being one object moving inside a boundary and passing to the other side. This was demonstrated by the increase in responses from children age 4 to 5 years showing TLD and children age 5 to 6 years showing TLD and the increase in the similarity of configuration of features seen in 100 per cent of adult selection of the image to demonstrate these features of the preposition 'through'. Children with SLI age 5 to 6 years responded using the identified configuration of features by adult participants but to a much lesser degree than their age matched peers showing TLD.
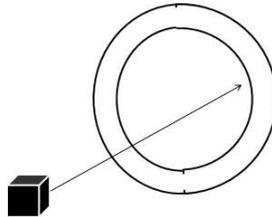
Figure 4.31. Image in the Adult Instrument that participants assigned the preposition 'through' (Animated image where the object inserts into the circular boundary and passes all the way to the opposite side).

Table 4.57.

Mapping of Semantic Features for Children Age 5 to 6 Years Showing Typical Language Development Children Age 4 to 5 Years Showing Typical Language Development and Children with Specific Language Impairment Age 5 to 6 Years in Response to the Prompt 'Through' and Adult Assignment of the Preposition 'Through'

Component	Children Age 5 to 6 years showing TLD	Children Age 4 to 5 years showing TLD	Children with SLI age 5 to 6 years	Features in Adult Instrument Image assigned the preposition 'through'
Containment	+ −	+ −	+ −	−
Contact Base	+ −	+ −	+ −	−
Horizontal Contact	−	−	−	−
One other object	+	+	+ −	+
Two other objects	−	−	−	−
More than two objects	−	−	+ −	−
Centrality	+ −	+ −	+ −	+
90 degree angle	−	+ −	−	−
Sided one face of object	−	−	−	−
Sided one face of object & base	+ −	+ −	−	−
Sided two sides of object on opposite faces	−	−	+ −	−
Sided four sides of object	+ −	+ −	+ −	+
Sided all faces except one	+ −	+ −	+ −	−
Sided all faces	−	−	+ −	−
Horizontal Plane	+ −	+ −	+ −	−
Projective plane	+ −	+ −	+ −	−
Vertical Plane	+ −	+ −	+ −	−
Movement/path	+ −	+ −	+ −	+

Note. In interpreting the feature analysis tables a minus symbol [−] denotes that the feature was not demonstrated by any children when the preposition prompt was give. A plus symbol [+] denotes that the feature was always demonstrated by every child when the preposition prompt was given. Often features were demonstrated by some children but not others. A plus [+] and minus [−] together in the same section denote that the feature was demonstrated by some but not all children so considered a feature for this preposition.

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4.4.11 Summary of the Responses to the Adult Instrument

Examination of the data and collation of the prepositions used in the responses quickly achieved saturation point as adults have very similar ideas of the configuration of objects. The only minor difference in the language used was recorded in the responses in the older adults (Over 45) where a few participants used the term 'fore' in place of front. This could be attributed to dialect or generational differences in the use of prepositional terms. Overall adults were able to use highly descriptive language to describe configurations and in fact have such flexibility with words that they can give extremely accurate detailed descriptions. Adults are able to use left and right relationships, different words to describe the planes such as diagonal and vertical planes, compass reference points and degree of angles to assist in conveying information.

The trials certainly provided more than enough evidence related to 'left' and 'right' usage in adults but did not provide enough of an understanding of how adults used preposition words or how these words related to specific features. The aim was to discover adult usage and understanding of related features of the target preposition words and to then be able to compare and contrast these understandings to those of children. This issue was rectified by making minor alterations to the Adult Instrument instructions. While the instructions did place restrictions on the selection of language adult participants were able to use it allowed a more in-depth examination of the assignment of preposition words. Even without using technical language in their responses to the images in the Adult Instrument adults tended to extend on the subtleties of the features of prepositions by using such words as 'above' instead of 'over' and 'below' and 'underneath' instead of 'under'.

In comparing the adult responses to the images in the Adult Instrument and those given in the trials of the Adult Instrument it could be seen that when provided with the choice adults will use the least language possible to describe the location or movement of objects. The trials saw adults incorporating more technical language to convey information related to the position or movement of objects. This may have been because they were expected to provide a written response. This enabled short written descriptions. Sometimes the technical language used by adult participants allowed them to omit using an actual preposition word. The final Adult Instrument instruction restrictions facilitated more prepositions to be used and a greater understanding of the associated features to be determined. In conclusion it appeared

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that it became increasing difficult, more labour intensive and required more lengthy descriptions to describe position and movement with accuracy when adults were stripped of using precise technical words.

Adults demonstrated that the central point of the faces of a referent object were extremely important in determining if the object being described had been positioned in what was considered to be a typical representation of the features of a preposition. Typical responses were assumed where responses to the images that contained features where the central point of an object was used as in 'in front', 'behind', 'next to'. Adults always assigned the preposition 'next to' to images depicting an object at a 90 degree angle as viewed by the participant. Adults showed that a symmetrical projective plane was the typical configuration of objects in images selected where the prepositions 'in front' and 'behind' were assigned. Any deviation from these central points meant that more language was used to support the preposition word and confirm descriptions.

Precedence of prepositions was examined by including images with more than one prototypical placement of shapes in particular positions to see if adults chose one preposition over another or ordered descriptions by describing a particular preposition before another (Adult Instrument Slides 4, 14, 33, 34, 40, 49, 51, 53, 58, 72, 75). It was hoped that it might assist in understanding which features are more prominent or necessary related to these prepositions. There appeared to be a precedence or hierarchy of rules that adults applied when determining and describing the position of static objects. Adults in this study always chose to describe prototypical configurations using a vertical or projective plane first followed by a horizontal plane (Appendix L). Regardless of how many objects in the image if there was a prototypical relationship demonstrated by objects adults did not describe the positions of other unrelated objects ignoring any other objects in the vicinity not positioned to demonstrate typical relationships (Appendix M). While not all adults did this (some adults insisted on attempting to describe every relationship) most adults did. In describing objects it is suffice to describe only one relationship if it is a prototypical one even if other relationships between objects could be alluded to. Distance and relative size of objects can negate relationships identified. This was seen in the responses to images where objects were placed at increasing distance from each other.

The following chapter provides an in depth discussion of the features described in the findings chapter. The degree of fit between the semantic features configured by children with SLI and those of children showing TLD for all prepositions is also discussed.

CHAPTER 5

Summary, Conclusions and Recommendations

This chapter summarises the semantic features demonstrated by child participants in response to individual preposition words. A detailed discussion of the semantic features identified in demonstrations by each of the groups of participants is given allowing them to be compared and contrasted. The semantic features derived from adult responses to images showing the positioning of objects is also discussed. The chapter is concluded by identifying the pedagogical implications of the research findings and recommendations for future research.

In presenting this synthesis of the findings it is not suggested that one perspective or understanding of the features related to a preposition word identified in demonstrations of any group of participants was superior in any way to that of another. It is merely to know what those understandings and perspectives are. Nevertheless, in order to purposefully converse fully with others within a culture there needs to be the same or similar meaning assigned to words. This is especially true of words such as prepositions that serve to illustrate relationships among other words in a sentence. Specifically, answers were sought in relation to the research focus questions which aimed to determine how semantic features are configured by children who show typical language development (TLD) and by children with an identified language impairment (SLI) in their understanding of prepositions.

5.1 Prototypical Features

A prototype is an example of what meets with the prototypical meaning for a given word. 'The fuzzy concept approach' outlined by Rosch (1973b, 1975b) and elaborated by Lakoff (1987) is related to indistinctness or that the more remote an illustration is from a prototype the less it is considered to be an example of that prototype. This proposal is conducive with the way the features of the prepositions studied emerged from the data. It is useful to extend this model and expect that personal experience also contributes to understanding and this can also be applied to the understanding to the known or socially acquired features of a concept. Vandeloise (1986) states that the typical use of objects influence the pragmatic relevance of the use of prepositions applied in a context.

This study revealed that quite possibly the acquisition and comprehension of each preposition word is linked to understanding the semantic features of each word. If a feature is placed as the centre idea for the meaning of a preposition then possibly firm prototypical or the 'ideal meaning' as Herskovits (1986) prefers to call it, means multiple examples in the sense of learning and remembering every situation or experience is neither possible nor needed. Mapping of the preposition word could involve central understanding of a prototypical feature which can apply to a context or situation where it is recognised or configured using an environmental object or self. This study aimed to examine these 'ideal' understandings or the semantic features that are understood by children showing Typical Language Development (TLD) and children with Specific Language Impairment (SLI). It is these central features of essence of a preposition word that can include geometric, functional and pragmatic components together with the current contextual use that facilitates the comprehension and use of the word.

Across the findings there are three levels of understanding related to the target preposition words. The semantic features that emerged from the data stem from a geometric system independent of function. Topological notions of inclusion, contact, proximity and projective relationships were identified. There is an extension of this geometric aspect and discussion of how this feature impacts on configurations of objects. Data collected also sheds light on how functional aspects of properties of objects can influence decisions related to the configuration of objects in response to the preposition prompts in children and the written responses from adults. Functional aspects are invariably based on geometric features. Within socio-cultural interactions a pragmatic level of understanding of the functionality of objects is also seen to be needed to be able to truly interpret contextual meanings of words (Aurnague & Vieu, 1993). It is not possible to separate the levels of semantic understandings of spatial words but it is important to know how they might fit and influence each other.

5.2 Containment and Support

The features of containment and support are reported to be understood very early in children who show TLD in their development of spatial concepts (Bowerman, 1996; Brown, 1973; Johnston & Slobin, 1979).

5.2.1 Functional Component of Preposition Understanding

The word 'in' has many uses in the English language. Bowerman and Choi (2003) explored the many categories in spatial relationships related to the preposition 'in' such as support, attachment, adhesion, hanging and piercing. They also offered a cross linguistic perspective showing differences between understandings varied across languages.

All children in each group of Stage 2 of this study responded to the prompt for 'in' by demonstrating features related to support and containment. One object was always selected and was also always contained in some way by another object by all the children in the main study. These features were also identified in all adult responses. The investigation by Garrod, Ferrier and Campbell (1999) suggests that an amalgamation of both geometrical and functional information is used when configuring the features of prepositions 'in' and 'on'. The verbalisations by children in this study showed personification of the inanimate objects provided as they verbalised perceived capabilities while configuring the objects. This further demonstrated their understanding and links to contextual experiences. Interestingly, adults in the trials of the Adult Instrument often described what an object seen in the image could do. In their responses adults described what an object could be doing or what it may have done. Essentially this demonstrates the respondent's understanding of the functional component of preposition understanding.

The study by Coventry, Prat-Sala and Richards (2001) demonstrated that interpretations of images showing objects configured to demonstrate the prepositions 'over' and 'under' were more influenced by functional properties of objects such as what they can do or what they can be made to do rather than on geometric qualities. Therefore we have to recognise the possibility that some children may have been using a functional approach or the physical relationships between objects to configure features of preposition prompts and not just producing geometric features. It is achievable however to extract the semantic features whether they are consciously configured or not.

The conceptual representation of each preposition is a composite of features or features amalgamated and fused in a variety of different ways. In examining the semantic feature tables it is easy to see how as features are acquired over time, it is simply configuring them in different ways to constitute a representation of the meaning behind a particular preposition. For young children the configuration of

features can be rigid and fixed. Adults were capable of extending the boundaries of what is acceptable related to the features understood in relation to individual preposition words. Containment is therefore a feature that is mentally represented through a series of processes that serve to give the idea of containment a typicality rating based on a functional basis. This then develops into a geometric ability to judge if the object can successfully hold or encase another object.

Containment of one object within another was always achieved by participants either by complete immersion within another object or partial immersion or inclusion. A hollow space was the fundamental physical feature of the object chosen by the participants in which to contain the selected object. When an object is 'in' a container, it is also 'on' (the bottom of) the object in a static position. Children demonstrated that complete immersion of the object is not always needed when configuring features of 'in' but a boundary is. Therefore, it cannot be concluded that a solid boundary or complete containment is an essential feature of 'in' as the object inserted is, at a geometrical level, within the interior of another object but it is not necessary for it to be shielded on all sides. Adults also consider partial containment or inclusion sufficient to constitute the features for 'in'. Extremely few children allowed the object selected to protrude from the encasement it was placed in demonstrating that complete containment i.e. a lid or cover was not necessary but a base and some sheath or partial covering of the sides is. The partial encasement of the sides of an object as a feature of configurations in the response to 'in' was not demonstrated by any of the 46 children age 5 to 6 years showing TLD. This demonstrates that at a geometric level, for the young children included in this study, features of the preposition 'in' means full immersion of an object inserted within the internal structures of another object.

Labas (2002) proposes insertion and subsequent containment are connected and dependent on each other when structuring features of 'in'. The children all inserted one object either by complete immersion or by inclusion within the boundaries of another object. When children demonstrated immersion they were not concerned with where the object landed as it was placed suggesting that particular placement such as centrally positioning of the selected and immersed object was not necessary. This observation is also supported by the work of Garrod et al. (1999) who expound that where an object lies in the containment is not a requirement or feature for determining 'in'.

Containment was also seen in the configuration of objects in response to 'between'. Nearly half of all the children age 5 to 6 years showing TLD and most of the children age 4 to 5 years showing TLD who responded to the prompt 'between' still required a degree of containment by keeping two sides of the central object covered, shielded or in contact with the faces of other objects. This need for containment in the configuration of objects in response to the prompt 'between' appeared significant in children with SLI but there were also many more children than those showing TLD who placed objects in proximity to another object.

5.2.2 Semi Permanent Containment

Containment was a distinctive feature seen in response to the preposition 'in' but it was also seen in the features demonstrated in response to the to the preposition 'around'. The features of understanding related to the preposition 'around' demonstrating the semi permanency of one object moving around another was seen as an extension of the concept of containment. Certainly less children responded to the prompt 'around' than to the prompt 'in' so we might suppose that the ability to apply containment in this fashion would be in some way related to the ability to self-create containment in a non-permanent state.

Piaget and Inhelder (1948) examined children's understanding in relation to cognitive development by conducting many experiments. Laurendeau and Pinard (1977) replicated numerous of Piaget's experiments confirming that by four and a half years young children are able to recognise and distinguish between forms of objects. This ability needs to be attained before more intricate spatial understandings related to position and locations of objects are acquired.

Moving one object 'around' another provides an encasement as the object follows the circumference of the static object. This would require the mental ability of retaining the path or movement of the object in motion. It also means knowing when the circumnavigation is complete. In order to demonstrate circumnavigation around an object children have to be able to not only see the object but from a three dimensional aspect they must be able to think about all sides of the objects. Children showed that they were able to use their knowledge of configuring objects that must be fully contained, so that there is no possibility of the object inserted becoming uncontained, to being able to control the containment by way of circling the object.

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A few children chose to demonstrate understanding of 'around' by attempting to surround the central object with other objects. Again this constitutes a notion of self-created containment. This is judged as advancement in understanding and is a demonstration of the firm features of containment that have been eroded and extended.

Partial containment was also seen in the responses of children to the prompt 'through'. The preposition 'through' refers to an inclusion relationship as well as a 'between' relationship. As one object is inserted within another during movement there is momentary containment provided as the object is encircled and passes through the boundary of another object. The development of the concept of containment can therefore move or shift from purely typical prototype examples of insertion into an object with fixed boundaries to a self-produced relationship of partial containment.

5.2.3 Connection and Convexity

Cohn, Bennett, Gooday and Gotts (1997) state that connection and convexity are shared by a range of spatial relations. Connection is defined as contact or overlap between sections of objects. Convexity relates to the presence in a region of interior spaces defined as a convex space or region within an object.

The prototypical example of 'in' is an object topologically inside another when one region completely surrounds the other as in the object being placed in a container or vessel (Cohn et al., 1997). All materialisations or acceptable demonstrations of 'in' cannot be explained by the convexity described by Cohn et al. (1997) and there are different degrees of containment or spatial constraint that would be seen in actual situations children are exposed to in the real world. Consequently there are a number of ways that one object can be represented as 'in' something else and different degrees and different kinds of constraints the location can place of its contents.

Connection is defined as contact or overlap between sections of objects (Cohn et al., 1997). The children who selected one object and placed it in the centre of the inner boundary of the hoop in response to the prompt 'in' quite clearly demonstrated contact and centrality as particular features in their own understanding related to inclusion. These children did not appear to be using a functional approach to configuring objects as reliable and sustained containment. Containment from the hoop did not exist as the support was not supplied from the hoop but from contact

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with the table. It could be supposed that children had constructed their own version of a container or vessel by using the surface of the table as the base of the container and the hoop as the sides. Or we might suppose that the children were demonstrating naive understandings of containment related more to concepts of contact and centrality. None of the children age 5 to 6 years showing TLD configured objects in this way. The few children age 4 to 5 years showing TLD and the small number of children with SLI age 5 to 6 years who selected and placed an object within the inner boundary of the hoop still achieved a contact and contained status for the object placed. We might interpret their responses as demonstrating partial semantic understanding of the word' in' as centrality was a feature of their configurations more reminiscent of features observed in responses to the prompt 'on'.

5.2.4 Support Relationships

All children in each group of the main study responded to the prompt for 'on'. Coventry and Prat-Sala (2010) conducted experiments to establish whether the support relation related to comprehension of the preposition 'on' is functional support or not. Coventry and Prat-Sala (2010) suggest that if the support relation for 'on' involves functional control then it could be envisaged that an object placed on the edge of a base or supporting surface is more likely to fall if the reference object is moved. This would demonstration features that still showing contact or connection but are less prototypical than a centrally placed object. Coventry and Prat-Sala (2010) also conducted a variety of experiments related to 'functional control' and what they describe as 'the located object effect' for 'in' and 'on'. It was seen that when objects that were expected through experience to need support and this support was compromised by position such as placement at the edge of the support object participants rated the examples given as less typical examples of 'on' than centrally placed objects. Overall it was concluded by Coventry and Prat-Sala (2010) that even though the comprehension of prepositions 'in' and 'on' are influenced by functional control it had minimal influence on comprehension compared to the meaning of spatial prepositions in terms of geometry alone.

5.3 Centrality

Children demonstrated that in response to the prompt 'on' they needed to position an object in a static position on a base or support. Objects for selection during the demonstrations were already presented to the participants on a base but it was interesting to note that none of the children stated that they did not need to select or move any of the objects as the features they understood related to the preposition 'on' were already being met. All children continued to re-assign a base for the selected object. Regardless of the base selected the subsequent placement object was always centrally placed. Meints, Plukett, Harris and Dymock (2002) also found typical understandings were found to be those objects that were centrally placed and therefore perceived to represent a more accurate example of the concept. This centrality in positioning objects has been found to play a role in early spatial understanding (Meints et al., 2002; Sinha, Thorseng, Hayashi & Pluckett, 1994). Indeed centrality was evident in observations of many of the configurations demonstrated by the participants in response to different preposition words used as prompts. This study showed that even prepositions that require movement or motion through a path and may not initially appear to require centrality as a feature in order to demonstrate the preposition such as 'over', and 'around' children still used the centre point or maintained a centre spot when configuring objects.

5.3.1 Centre Points of Static Objects

Tyler and Evans (2001) discuss the many applications or interpretations of the preposition 'over' stating that the word is polysemous or it has multiple meanings that are semantically related. Examples are physically covering or being 'over' another object or metaphorically such as having power 'over' someone. However, Van der Gucht, Willems and De Cuypere (2007) discuss the difficulty in determining a semantic relationship for the word 'over' as the use of the word in the context of the sentence determines the meaning. Many of the applications of the word 'over' used in sentences are abstract notions. In presenting children with a prompt consisting of one word it meant that they were able to draw on their own prior knowledge and semantic lexicons and apply prototypical examples known to them. What was remarkable was that most children showing TLD from both age groups who responded in the main study chose to demonstrate their understanding in the

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same way. They interpreted the prompt by exerting a vertical movement over another object as opposed to a static placement of objects. Adults rarely assigned the preposition 'over' to the static images of one object statically suspended above another. In response to the prompt 'over' children with SLI age 5 to 6 years demonstrated fewer static placements and movement was still the predominate feature.

Centrality was again marked in children's responses to the prompt 'over' as the object selected was moved up and over the centre point of the static object suggesting the need to ensure that 'over' is movement and path that must be executed in a fashion that ensures the object being moved does actually move centrally over another. This was in contrast to a haphazard approach to the movement of one object over another where the static object is beneath. Centrality was also a feature demonstrated by those participants that placed an object in contact with another object in an effort to cover some part of the upper face of the static object beneath. Adults always described this kind of contact configuration between objects seen in the images as related to the preposition 'on'.

Centrality was listed as a component of the preposition 'under'. Centrality was observed in the demonstrations but the evidence was not totally convincing that centrality was an essential feature of the children's response to the prompt 'under'. The feature was demonstrated by the majority of children from all groups in the main study but not all. Regardless of the configuration of objects in response to the prompt 'under' there was always some sort of covering of the opposite faces (the base and top) of the object. This did not need to be direct contact but more than often this was the case. Further clarification of the component of centrality would require additional investigation to confirm centrality as a necessary feature of the preposition 'under' in young children. Centrality was not a feature demonstrated in the images related to adult written responses.

5.4 Proximity

While direct comparisons can be made between the configurations of features used in understanding prepositions by children aged 5 to 6 years showing TLD and children age 5 to 6 years who have been diagnosed with SLI the most striking are the semantic features related to placement of objects when responding to the preposition

prompts 'behind' and 'in front'. The study aimed to identify and examine the features demonstrated by children with SLI and those used by children showing TLD in configurations in response to preposition words and to show to what extent the semantic features used in each group in their understanding of prepositions mapped onto each other. On initial examination of the collective overall semantic features used by all children in the main study in response to these preposition prompts it can be seen that the features appear similar for all groups of participants in Stage 2 of the main study. It is the extent that these features are demonstrated that is different. The children age 5 to 6 years showing TLD all configured objects for the prompts 'in front' and 'behind' as opposites with all the children using either a projective or horizontal plane or centrally adjacent placement of the objects used. This symmetrical configuration was not seen as conclusively in the demonstrations of children with SLI age 5 to 6 years.

5.4.1 Symmetrical Configuration

'Behind' and 'in front' are generally accepted as opposite terms with 'in front of' explicitly referring to the attributes of the object, while behind does not (Durkin, 1981). Functional criteria are often used to identify, the 'front' or the 'behind' of a particular object. Where there are no criteria to assign features to a referent object position is usually given by transferring a mirror reflection of the observer's bodily axes (Kemmerer, 2006). Harris and Strommen (1972) found that despite either an objective axis or subjective axis 97.5 % of subjects' responses were symmetrical. Approximately 90 % of children age 5 to 6 years showing TLD placed objects centrally adjacent and symmetrically opposite using a vertical plane. Cox, Batra and Singal (1981) reported that by 6 to 7 years of age in children from three language backgrounds (English, Bengali and Hindi), there was common agreement that the space between an object and self was 'in front' and the location on the far side of the object was interpreted as 'behind'. The majority of adult responses to images in this study also supported this intrinsic relationship when describing objects on a projective plane together with a symmetrical configuration. This absolute configuration of features in response to the prompts 'in front' and 'behind' was not seen in the children with SLI age 5 to 6 years. The placement of objects symmetrically opposite to each other to demonstrate 'behind' or in front' was

demonstrated by all children age 5 to 6 years showing TLD suggesting an eventual fixing or 'cementing' of these features.

In comparing and contrasting the data in the main study collected from those children age 4 to 6 years showing TLD and children with SLI aged 5 to 6 years the configuration of 'behind', 'in front and 'next to' may reveal an insight to patterns of understandings. Closer examination of the data related to 'in front' and 'behind' reveals a more accurate match in the data for the configuration of features demonstrated between children age 4 to 5 years showing TLD and children aged 5 to 6 years who have been diagnosed with SLI. Of these children aged 4 to 5 years showing TLD three quarters of the children included in the study who responded used a projective configuration and centrally adjacent placement of objects when responding to the prompt 'in front' and 'behind'. While this is not as conclusive as the responses from children age 5 to 6 years showing TLD it does suggest that many children age 4 to 5 years showing TLD are also using both an opposite projective configuration. Just four children age 4 to 5 years showing TLD (7 % of those who responded) did not use a projective or symmetrical configuration when responding to the prompts. These configurations are similar to those observed in children with SLI age 5 to 6 years suggesting that there is possibly a pattern of acquisition linked to maturity or experience leading to opposite and vertical placement of objects in the understanding of 'in front' and behind' seen in children showing TLD. The fixed nature of opposites and projective features of 'in front' and behind' is also seen in adult responses to images.

5.4.2 Intrinsic Referencing

During demonstrations to configure features related to the preposition prompts 'behind' and 'in front' two objects were always used by all children in each participant group. The protocol listed the prompt 'in front' (protocol prompt number three) before 'behind' (protocol prompt number ten). Objects were always repositioned back to the same starting point during the protocol and participants decisions to configure objects and features were seemingly independent of one another. As no fronted objects were provided for use in the main study it is suggested that all the participants from any group that configured objects were able to use memory of their previous positioning of 'in front' to or self-reference to influence their choice for positioning objects in relation to the prompt 'behind'.

While the children with SLI may have an understanding similar to the children showing TLD there may have been some lack of retention of where the first placement of objects was made in response to the prompt 'in front'. It could be offered as an explanation of the non-symmetrical placement of objects in children with SLI age 5 to 6 years. However, Archibald and Gathercole (2005) concluded that while children with SLI may have difficulties with verbal working memory they had no difficulties with visual spatial immediate memory compared with age matched peers. It is therefore possible that children with SLI demonstrated a lesser ability to use intrinsic referencing in configuring objects as 'in front' and 'behind'. Other studies also show visual spatial deficits in children with SLI or that these children respond more slowly than children showing TLD during visual spatial tasks (Johnston, 1982; Johnston & Ellis Weismer, 1983).

5.4.3 Visualising and Verbalising

'Visualising' and 'verbalising' is the ability to create and describe mental pictures either for a single word or for a paragraph (Bell, 1991). Gestalt imagery is then verbalised to aid comprehension and strengthen association of words. The ability or inability to visualise and retain visual information may have impacted on placement of objects when configuring features related to proximity. In other words, even though each set of features configured for the prompt 'in front' then later in the demonstration sessions 'behind' may have been understood by children as opposites because the first placement of 'in front' was removed in the repositioning objects between prompts the inability to visualise may have been reduced. Therefore the children may not have had a reference of a previously placed object e.g. an object already placed and self-labeled by the participant 'in front' to refer to or assist in placement of another when configuring features of the preposition 'behind'. If we choose to accept the hypothesis that there was understanding of features related to 'in front' and 'behind' but no cognitive reference to previously placed objects then we also have to accept that many children who have a diagnosed language impairment (SLI) may indeed present with difficulties with short term memory retrieval or cognitive visualising related to spatial reasoning. This could have impacted on their ability to demonstrate known semantic features when presented with verbal preposition prompts. This would also be compounded if children have immature or fragile understandings of spatial features related to the projective plane. Whatever

the underlying reasons were for these atypical placement of objects in response to the preposition prompts 'in front' and 'behind' many children with SLI demonstrated features related to a projective plane. Children with SLI also demonstrated the same shared non-typical configurations of semantic features which were very different to their age matched peers showing TLD.

5.4.4 Contact Placement for Objects

Mapping of the configuration of the placement of objects in response to the prompts 'next to' 'in front' and 'behind' highlighted that many children with SLI configured features that might be evaluated as non-typical random placement. Children with SLI displayed an over-generalisation of known semantic features. Johnston (1984) states the meaning of 'behind' for the young child appears to be 'hidden' and the meaning for 'in front' could be 'visible', rather than a particular spatial relation between two objects. Children with SLI age 5 to 6 years who made contact placements using the horizontal faces of an object demonstrated a partial understanding of the features associated with the prepositions 'in front', 'behind' and 'next to'. The children with SLI age 5 to 6 years appeared to firmly understand that the object selected did not need to be contained by another as in the features for the preposition 'in', which all children in each group clearly demonstrated. They also appeared to understand that the object selected must be in contact with or very close to another object with contact to the base. Features of the placement of objects in response to the prepositions 'in front' and 'behind' and 'next to' may in fact be treated collectively.

Durkin (1981) discusses observations of contact placements in young children's responses to a range of locative instructions and concluded that contact may be a strategy accessible to the child if there is ambiguity of the exact meaning of the given preposition. Contact placement for objects in response to the prompt 'next to' was seen in almost 90 % of the children with SLI. Durkin (1980) also hypothesises that the amount of distance tolerated by young children making placements of objects in response to the preposition 'near' increases with age. Durkin's finding could be applied to the children's responses to 'next to' in this study as the preposition 'next to' also involves the feature of proximity and not necessarily demanding contact. Durkin (1980) further states that children tend to make fewer contact placements as

they get older and this was certainly the case in this study for children age 5 to 6 years showing TLD compared with children age 4 to 5 years showing TLD.

5.4.5 Over-generalisation and Over-extension

Essentially non-typical configurations by children in this study in response to the prompts 'in front' and 'behind' may just be an over-generalisation of understandings related to 'next to'. Configurations of objects relate to an awareness that this preposition requires proximity or that one object needs to be near another. Children could also be over generalising and using this understanding to respond to the prompts for 'behind' and 'in front'. Children age 4 to 5 years showing TLD and children with SLI age 5 to 6 years who did not use both projective placement of 'behind' and 'in front' together with 90 degree angle positioning for 'next to' may have been placing a selected object using their understanding of proximity. This is rather than using an understanding of opposites or using the understanding of 'in front' of and 'behind' as relations of anteriority and posteriority, 'behind' being non-visible' and in front being 'visible' or of assigning a non-existent front or back to the referent object. Therefore it could be concluded that more than half the children with SLI age 5 to 6 years included in the study may actually be presenting with an understanding of the features of prepositions 'in front' of, 'behind' and 'next to' that is based on proximity alone and consequently limited in semantic features in comparison to that of their age matched peers showing TLD.

Adults have firm understandings of preposition features and are able to extend these concepts to non-typical configurations. Adults showed that they were easily able to relate to typical and non-typical configuration of object placements while using the appropriate language. This shows that non-typical configurations can become part of the lexicon for spatial understanding but it must be matched with the comparative language to support it. Non-topological prepositions such as 'behind', 'next to' and 'in front' can be modified by a comparative word or phrase. If an object is configured in a position that fits with the prototype or typical representation of the features associated with a preposition by adults only used the preposition word, if a configuration of objects was close to a prototype of a particular preposition the amount of supportive descriptive language used by adults was greatly increased which provided clarity to the location or position. It is very doubtful that the children in this study who placed objects in close proximity to each other in response to the

prompt 'next to' and did not use a 90 degree angle were displaying these sorts of sophisticated understandings. In light of the data collected from children age 5 to 6 years showing TLD and the fixed nature of the configuration of objects in almost all of these children it can be concluded that a 90 degree angle configuration of objects could be accepted as the 'norm' for children showing TLD in response to the prompt 'next to'.

The majority of the younger children age 4 to 5 years showing TLD also used a 90 degree angle configuration for objects placed in response to the prompt 'next to' and almost half these children included in the main study configured objects for 'in front' and 'behind' as described for the children age 5 to 6 years showing TLD. This suggested a pattern of feature configuration or a maturing of development in the majority of the younger age 4 to 5 years children showing TLD that may eventually match that demonstrated by the older 5 to 6 year old children showing TLD. Five of the eight children with SLI age 5 to 6 years also did not use a projective plane (180 degree angle as viewed by the participant) when configuring objects for the prompt 'behind' and 'in front'. If we remind ourselves of these children's non 90 degree angle placement for objects in response to the prompt 'next to' this collates to a fifth of the children in the main study with SLI not placing objects in what was characteristically seen in children showing TLD who were age matched peers when demonstrating semantic features in response to 'in front', 'behind' and 'next to'. Or in other words the children with SLI knew that two objects must be used but had not fixed the positioning of these terms in relation to exactly where in relation to a second object they should be configured.

There are notable consistencies in the non-typical configuration of objects in response to the prompts 'in front', 'behind' and 'next to' in the demonstrations made by children with SLI age 5 to 6 years. This demonstrated that children with SLI age 5 to 6 years had established some sort of spatial orientation with respect to their own body that was intuitive rather than based on accuracy. Non-topological prepositions such as 'behind', 'next to' and 'in front' are perhaps more difficult to differentiate. The configurations of semantic features for these prepositions demonstrated by children with SLI were possibly made based on knowledge that these objects need to have contact with a base and to be in the close vicinity of another object. The children were not able to demonstrate firm or differentiated features or relationships between the objects or the prepositions 'behind', 'in front' and 'next to'.

5.5 Patterns of Feature Understanding

Slobin (1971) proposed that the central determinant of order of acquisition for linguistic (semantic) distinctions was their comparative cognitive complexity. It can be seen in the summary of the findings for each preposition that the more features that were involved in configuring the objects the less children from each of the groups in the main study that responded. Clark (1973a) suggests the order of complexity should be semantic features of 'in', then 'on' and then 'under'. In agreement with this recently conducted studies have shown through analysis of parental surveys and observations that the first understandings of prepositions by young children develops with the concept 'on' which is followed by 'on' and 'under' (Liekin, 1997; Meints et al., 2002; Rohlfing, 2006). Perceptual changes in either the figure or landmark may direct children's attention to the spatial relation and consequently aid them in discriminating these relations earlier in development than spatial relations that lack these perceptual changes, such as support or proximity 'next to'. Comparative cognitive complexity or the increased number of features in configurations does not necessarily allow a linear acquisition of specific semantic features to be constructed such as for prepositions 'in', 'on' and 'under' or any other preposition.

5.5.1 Partial Understanding or Partial Application of Features

Clark (1973a) discusses non-linguistic strategies used by children in interpreting word meaning. Clark examined young children's (age 1:6 to 5 years) understanding by giving instructions requiring comprehension of the prepositions 'in', 'on' and 'under' and concluded that children rely on hierarchical rules when presented with preposition words they are yet to fully comprehend. Rule I: If the reference point object is a container, x is inside it. Rule 2: If the reference point object has a supporting surface, x is on it. It is suggested that these rules are applied if the child does not know the meaning of a preposition.

The non-linguistic strategies themselves would seemingly be developed from the child's conceptual knowledge about the objects. While complexity of configurations was not the focus of this study it may reveal why some children did not seek to fully immerse objects in response to the preposition prompt 'in' choosing

to configure objects using features more representative of those seen in the response to the prompt 'on'.

The possibility of partial understanding or partial application of known features of prepositions surfaced again with almost half the children with SLI age 5 to 6 years who responded to the prompt 'between' using two objects placing one object centrally adjacent to one other object in either a projective or horizontal plane. There was an element of symmetry expressed as most children age 5 to 6 years showing TLD configured two identical objects either side of a central object. What was apparent was that in response to the preposition prompt 'between' children with SLI age 5 to 6 years rarely deviated from making similar non-typical configurations with objects. The children with SLI regularly configured features using only two objects. This possibly demonstrates a shared fragile understanding in these children related to the word 'between' in comparison to most children age 5 to 6 years showing TLD who showed a more adult–like understanding in configuring three objects in a horizontal plane.

5.5.2 Multifaceted Configuration of Features

The cohort for the children showing TLD included a wider age span in order to determine if there was a 'fixing' of semantic features related to lexical items that suggest an 'adult –like' understanding of prepositions. The data supports the proposal that many children with SLI age 5 to 6 have a different understanding of the configuration of features related to some prepositions than their peers showing TLD. These understandings are also different to adult understandings that are being perpetuated in socio-cultural environments. Features of some prepositions such as those seen for 'between' or 'through' are complex. They include more configurations of features and less children responded or configured objects in response to these prompts. There were some children in each of the groups that demonstrated their understanding of 'through' by displaying features such as centrality and containment that had been observed in response to the prompt 'in' and 'on', vertical movement observed in response to 'over' and 90 degree positioning seen in response to 'next to'. Possibly the complexity involved in acquiring an understanding of some prepositions such as 'between' or 'through' means that children take longer to acquire the skills to be able to simultaneously configure many different features.

Once the ability to configure multiple features is acquired the preposition features quickly match adult understanding and prototypical configurations.

5.5.3 Mapping Semantic Features

Prepositions that require the configuration of fewer features appear to underpin all other relationships related to the spatial words targeted in this study. Contact and containment are fundamental features as is centrality. Sensitivity to salient features becomes refined as the conceptual framework related to the universal primitives is able to be expanded through experience or acquisition of more language as seen in adult responses. Children appear to move towards allowing containment to be less restrictive and for some configurations contact to be a matter of choice. This occurs while children further develop their understanding of an object as a whole to being able to identify and incorporate specific geometrical features related to centrality of faces of objects. This development means children have individual understanding and may show proficiency in configuring some features or the extension of core features more easily than others. This is direct opposition of children acquiring understanding of prepositions in a regular order, assumed to reflect underlying universal determinants.

The features related to the prepositions targeted in this study stem from the early firm understanding of features of immersion or containment and contact, the robustness of these features make it apparent why they are easily generalised to different contexts and objects by children. This would be especially so if adults reinforce these features through interactions and the functionality of objects support learning. The ability to control or recognise precise movement or path extends these concepts. Application of movement features allows a greater number of spatial concepts or categories to be labeled with the words of the culture that children live in. Combinations of these features at varying degrees of intensity or distortion can be identified in the target prepositions in this study. Therefore rather than having a variety of isolated features that are defined as absolute there are core features such as containment, contact, centrality and movement that can be gradually manipulated and broadened by assigning language labeling that is shared within the socio-cultural contexts of the society in which we live.

Children with SLI age 5 to 6 years demonstrated a different understanding of the semantic features of some prepositions than their typically developing peers. The

configuration of objects and the features that can be extracted from these configurations demonstrated that children age 5 to 6 years showing TLD have similar firm understanding and these understanding are reminiscence of those of adults.

5.6 Language as a Mechanism for Developing Spatial Concepts

A review of the literature firmly established that children with SLI find it more difficult than their peers showing TLD to acquire and learn many different aspects of language (Bishop, 1992, 1997; Carrow-Woolfolk, 1988; Clahsen, 1989, 1991; Leonard, 1998; Norbury, Bishop, & Briscoe, 2001, 2002). Children with SLI age 5 to 6 years demonstrated that they have basic understandings related to spatial relationships but may not be able to diversify these known spatial categories purely due to the inability to acquire the associated language. This means the language itself could evolve the concepts and the features of the relationships between objects. This may sound like a rather basic assumption but it suggests that if this is how children showing TLD extend on their understandings and lexical categorisation of relationships between objects that the language acquisition and use actually has a part to play in developing the meaning behind prepositions and the assignment of the configuration of features. In other words children with SLI could effectively be unable to acquire the language to enable extension of the early spatial features.

Children with SLI have many difficulties related to learning language such as understanding the referential intentions or pragmatic cues by the speaker that can assist in determining reference (Baldwin, 1991). Children with SLI also have distinct difficulties with short term memory and these difficulties which can further complicate word learning (Archibald & Gathercole, 2005; Botting & Conti-Ramsden, 2001; Carrow-Woolfolk, 1988; Ullman & Pierpoint, 2005). If the language itself is indeed an important device for developing innate spatial concepts the problem of acquiring a tool for developing spatial categories and furthering concepts is compounded for children with SLI.

Using spatial terms requires recognising the spatial relationships as objects are configured or the paths of movement they take. Innate abilities that children have may not explain the development of further spatial concepts and the fine tuning of features that can be seen in adults. As children acquire spatial terms, exposure to spatial language itself may assist in extending these categories and in the categories

becoming more complex and diverse (Bowerman & Choi, 2001: Choi, 2006). Many children with SLI do not configure the features of preposition in the same way as their age matched peers showing TLD. If language specific input influences children's non-linguistic spatial cognition it could be supposed that as a result of language impairment or the inability to acquire language is therefore directly impacting on the development of those concepts.

It is interesting at this point to re-examine the 'Critical Age Hypothesis'. (Curzan & Adams, 2009). Casasola, Wilbourn and Yang (2006) showed comprehension of a novel spatial word using a preferential-looking prototype with 21 and 22 months old young children. The experiment identified that children of this age easily mapped the new spatial concept suggesting that innate spatial ability was present and at this age can be manipulated by language. There is a concern that if language facilitates learning of spatial concepts and that these abilities are innately dormant, there may be a point of time in early childhood that despite intervention children with or without SLI will find it difficult to acquire language similar to their peers.

5.7 Pedagogical Implications

Adults need to have an awareness of the features children understand and use in relation to preposition words. This is particularly significant given the role that adults and parents have in modeling preposition features and language. The study did not seek to measure curriculum delivery related to prepositions but sought to identify features associated with these prepositions. It is acknowledged that therapy for children with SLI in specialised language centres may have targeted vocabulary but may not have targeted the specific features associated with preposition words in this study. Given the eventual atypical but consistent responses by children with SLI to some prepositions e.g. 'behind', 'in front', 'next to' differences in configuration of features related to prepositions were identified in children with SLI and non-SLI children regardless of any intervention. An awareness of children with SLI understanding of preposition words in comparison to those of children showing TLD assists in the development of strategies for teaching or parenting. This study showed that understanding of semantic features related to individual prepositions in some responses given by children participants, especially children with SLI age 5 to 6

years could possibly be interpreted as mature extensions or application of features seen in adult responses. This is especially relevant for the semantic features configured for 'next to' where many children with SLI age 5 to 6 years in the study configured objects as might be seen as acceptable. This is given that adults in this study assigned the preposition 'next to' if objects are in close proximity to one another but not necessarily presented using a 90 degree configuration. Consequently, children who show similar understandings to those seen in this study could potentially be treated as being proficient rather than in early stages of developing understanding of features of prepositions or as having limited understanding.

5.8 Summary

This research has provided a small beginning to examining the understandings children have related to the meanings of prepositions. Preposition words used in the prompts hold individual meaning for each child in the main study. Collectively, the features identified in the study show that there are many features that are common across understandings of preposition words. However, these features may not be configured in the same way by all children. It has been previously established that children with SLI have difficulties learning language at the same rate as their peers showing TLD (Bishop, 1992; Carrow-Woolfolk, 1988). This study demonstrated that the understandings children with SLI age 5 to 6 years have related to preposition features showed not only a difference in the rate of learning as seen in age matched peers showing TLD but for some prepositions a difference in how children with SLI configure these features.

Each child is different and the findings discussed in this thesis are representative of the typical configurations made by groups of children in this study in response to the prompts. Essentially the understandings that some children in the study demonstrated, as seen in the prominent configurations are imbedded within the adult understandings. All explanations of understandings related to the configuration of objects and the responses given by adults cannot be explained by solely assigning geometric features but it has been used as a way to assist in the exploration of the differences in understanding between children age 5 to 6 years showing TLD and children with SLI age 5 to 6 years. Features demonstrated by children display typical central understandings that can be seen to underpin many of the sprawl of semantic

features that surround other prepositions. There was very little difference in the configuration of features for some prepositions such as those demonstrated for 'in', 'on', 'over', 'through', 'around' and 'across' in children showing TLD, children with SLI or adults. Adults have a sophisticated application of the typical features of prepositions demonstrated also by some children. This is especially apparent in relation to the prepositions 'in front', 'behind', 'next to' and 'between'. Bowerman and Choi (2001) state that when children describe location, position or movement of an object the language they use resembles that of adults in their home language, rather than the language of children at the same age who are immersed in other language groups. This fixing of features for English prepositions was demonstrated in mapping the understandings adult have related to preposition features and those identified in the typical configurations seen in some children.

5.9 Recommendations

Recommendations from this research study target further investigation of underlying differences in understandings, intervention, improvement in teaching efficacy and subsequently improving outcomes for children with SLI from a variety of perspectives.

5.9.1 A Longitudinal Follow up Study

A longitudinal follow up study would be appropriate and may show if and when we might detect when children with SLI and younger children showing TLD children for that matter, move into the fixing stage for preposition meaning e.g. 90 degree placement for 'next to', projective symmetrical placement of objects for 'in front' and 'behind' before being able to generalise features. It could serve to determine predictors of linguistic development and specifically to identify if semantic features related to prepositions in children with SLI stem from a delay, an immaturity or if there is in fact a rather idiosyncratic course of learning leading to atypical results.

5.9.2 The Protocol as Assessment Tool

The protocol itself has merits to be used as an objective assessment tool to determine children's early understanding of semantic features related to prepositions. Children appear to start their learning journey with an understanding of specific

features by fixing selected features to prepositions before being able to modify central features, accept alternatives or extend on fundamental features. Any response that children gave when configuring objects is their current understanding and does not suggest that the child has arrived at a stable interpretation of the features of a given preposition word. The language required in describing the position and movement of objects with accuracy develops over time. This was seen in the responses from adults. As a result, it would be expected that children would increasingly be able to associate with and use more scientific and technical language to interact and convey understanding. Even the ability to use 'left' and 'right' greatly increases descriptive ability, understanding and the ability to extend the boundaries of prototypical examples and reduces error or ambiguity in giving descriptions. Franklin and Tversky (1990) conducted a study where participants completed tasks confirming where particular objects were located. Franklin and Tversky showed that response times to verify objects along the vertical plane of above and below were more rapid than to objects on the projective which were also quicker than to objects on a horizontal plane targeting the left and right axis.

Adults in this current study demonstrated that when viewing the images there was a preference to describe configurations using a vertical or projective plane first followed by a horizontal plane. It would be useful to study adult interactions and utterances used with children to see if this pattern or precedence in describing preposition features is apparent in speech and if it has any bearing on children's acquisition of preposition terms.

The aim of the study was not to compare methodologies or to compare the results from this study with current assessment tools. However, it is anticipated that the tasks developed in this study have advantages over other such measures and could be the subject of as a potential future study

5.9.3 Crossing the Midline

Many of the features demonstrated by child participants in this study in response to the preposition words rely on being able to identify with central points of horizontal and vertical planes of objects. This may require children to have developed the ability to cross the midline of their body in order to configure objects. There is a developmental trend in the ability to cross the midline and therefore the ability or inability to cross the midline equally applies to all children in this study

(Carlier, Doyen & Lamard, 2006). Studies have confirmed that young children may prefer to reach to the left with the left hand and to the right with the right and not show the adult pattern of hand use with both hands until seven to eight years (Bradshaw, Spataro, Harris, Nettleton & Bradshaw, 1988). Hill and Bishop (2005) discuss whether hand preference recorded in children with SLI or the preference to use whichever hand is closer to complete tasks may be a display of motor impairment. Hill and Bishop provided children with SLI tasks where they were required to cross the midline of their body but many children actively choose not to. Hill and Bishop (2005) discuss the results of the potential effects of language impairment in children in regard to selecting physical objects and not crossing the midline of the body.

The inability to cross the midline of the body was not relevant to the data that was collected in Stage 2 of this study as objects that could be used in many different ways were available on the table in front of the children across left and right for them to select from. Actual left or right configurations or moving an object within intralateral space vertically, horizontally or to contain it with regard to responding to the prompts are not relevant. Demonstration of understanding of semantic features is perfectly possible and acceptable if participants just use ipsilateral space or the immediate space in front of the body when configuring objects. Language is typically lateralised to the left hemisphere of the brain. The poor performance observed by Hill and Bishop (2005) could be an indicator of motor impairment or of language lateralisation or a failure to establish a clearly dominant hemisphere. The ability to cross the midline of the body to reach into contralateral space is associated with disordered language development and requires serious consideration as an explanation of the atypical configuration of semantic features seen in children with SLI (Orton, 1925).

The 'Quantification of Hand Preference (QHP) task' developed by Bishop, Ross, Daniels and Bright (1996) can be used to determine if children rely on the preferred hand or cross the midline of their body to complete tasks. A further investigation to examine preferences in children with SLI who avoid crossing the midline to see if there is a relationship between midline crossing inability and the actual acquisition or the fixing of features related to the prepositions 'in front', 'behind' and 'next to' would be enlightening.

5. 10 Intervention for Children with Specific Language Impairment

Intervention for children with SLI aims to improve language achievement. While language acquisition and comprehension is paramount ultimately oral production or verbalisation is the aim leading into written proficiency. The oral production of prepositions is significantly more difficult than the formation of understanding of this closed class of words (Grela et al., 2004; Marina et al., 2005). Studies investigating qualities that may identify children who are good word learners showed that children with SLI need more repetitions of a word than peers showing TLD together with more opportunities to imitate the word before they are able to use it independently (Arcihbald & Gathercole 2006; Carrow- Woolfolk, 1988; Gray, 2003; Wilkinson et al., 2003). Gray (2003) suggested that intervention for children with SLI should include introducing a limited amount of vocabulary at any one time, substantially less than for peers showing TLD.

It has been established that children with SLI find it more difficult than their peers showing TLD to acquire and learn many different aspects of language (Bishop, 1992; Carrow-Woolfolk, 1988). The cause of this difficulty is complex given that children do not present with obvious factors directing where the problems with acquiring language emerge from. Findings from this study has shown that in spite of these difficulties children with SLI do have an understanding of many of the features associated with prepositions, albeit in some instances different to that of age matched peers showing TLD. In conducting a longitudinal study and following the development of a particular cohort of children, planned intervention programs could demonstrate if there are specific idiosyncratic strategies that can be employed when teaching children with SLI extraneous to the development seen in children showing TLD.

5.10.1 Explicit Teaching

The centre point of any face of an object is undeniably an important factor when configuring objects in relation to preposition words or when there is a need to describe positioning of objects to someone else. Explicit teaching is "explicitly giving directions for completing a task; providing facts, verbal labels, or other specific information" (Bredekamp, 2011, p.276). Given the results of this study it would appear that explicit teaching that focuses on teaching centre points of objects

would greatly assist in children who have difficulties learning prepositions such as those with SLI. Wilkinson et al. (2003) suggested that 'fast mapping' and language acquisition may occur when parents look at or point to an object and label the object, explicitly directing children towards particular information to learn. The identification of central points on the faces of objects could be learnt becoming a starting point for lexical development of the features of prepositions.

Given the non-typical configurations of semantic features demonstrated by children with SLI for some prepositions it seems obvious to suggest that when teaching children with SLI the educator needs to ensure that the same point of view is used by both the child and the tutor. There is a strong tendency for children with SLI age 5 to 6 years to use proximal relations for projective relationships producing non-typical configurations in response to the prepositions 'in front', 'behind' and 'next to'. The focus of teaching needs to be on teaching actual projection from self. This is rather than assuming the child is able to intrinsically project themselves in relation to objects or to imitate the configurations of the educator while taking their own perspective on the scene.

5.10.2 Utilising Visual Prompts

Gestures are used to communicate, to compliment or replace language by using hands, fingers, arms or body movements. Gestures include eye contact, deictic gestures such as pointing, ritualised request gestures such as pulling at an empty hand to get something, representational gestures such as cupped hand to represent drinking or symbolic gestures such as waving (Alibali, Heath & Myers, 2001; Crais, Douglas & Cox Campbell, 2004). Gestures develop alongside language and assist language learning (Capone, 2007; Capone & McGregor, 2004; Crais et al., 2004). Spontaneous gesture produced by children with SLI has been shown to be apparent at twice the rate than production of gestures by children showing TLD suggesting that gestures may facilitate a compensatory role when children have difficulties with expressive language (Evans, Alibali & McNeil, 2001). Language learning can be enhanced when children are told and shown how to gesture (Cook, Mitchell & Goldin-Meadow, 2008). The use of visual or gestural cues, environmental reference points and pictures when learning new vocabulary may reduce the information processing load while aiding attention and long term memory (Bunning, 2004). This study has identified features related to prepositions and using

gestures when teaching prepositions to highlight the features associated with individual preposition words may assist children with language learning difficulties to learn and understand new vocabulary.

5.10.3 'Visualising and Verbalising'

'Visualising and verbalising' is the ability to firstly create and then verbally describe mental pictures either for a single word or for a written paragraph. Verbalising the gestalt image or the image in its entirety has been shown to aid comprehension and can strengthen association of words (Bell, 1991). Silverberg & Buchanan (2004) studied participants who verbalised when attempting to remember pictorial items and those participants that did not. Verbalisation while viewing the items resulted in increased recall. Gill, Klecan-Aker and Fredenburg (2003) conducted a study showing that in a short amount of time children can be taught to increase their proficiency in following directions by teaching them to use a strategy of rehearsal together with visualisation, 'Visualising and verbalising' is a strategy that may assist children with SLI with vocabulary understanding and recall words. Explicitly teaching children 'visualising and verbalising' techniques or gestures complements Vygosky's (1962) beliefs as they both offer support or a scaffold for learning.

5.10.4 Physical Activities and Spatial Relationships

Studies have confirmed that there is considerable association between SLI and poor motor skills (Bishop, 1990). It would therefore seem sensible to explore teaching children with SLI features of prepositions through repeated expose to physical activities that extenuate the spatial features and relationships between objects while children are physically engaged in gross motor activities. It is suggested that children are also taught the previously discussed techniques of 'visualising and verbalising' the actions they perform in an effort to support memory of semantic features related to prepositions. Following motor activities and possibly viewing both static and motion photographic records of their participation children can be assisted to both visualise and verbalise actions and relationships between objects or their own body and objects.

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5.11 Conclusion

Educators are at the forefront of teaching students with disabilities and in order for this population of children with SLI to achieve in educational settings, avoid lifelong problems in areas of socialisation and achieve academically a substantial differentiation of the curriculum is required. For children with special needs linked to language difficulties, differentiation of the curriculum is seen as a contributory factor to successful inclusion in the mainstream classroom (Scott & Spencer, 2006; Westwood, 2001). The responses to the preposition prompts have shown children's understanding of features related to preposition words in context free situations. This study gives an overview of typical understandings and possibly the central or a prototypical understanding typically language developing and children with SLI have for each of the prepositions targeted. It is the understanding of these features of prepositions that children draw on when making meaning from speech or from instruction or when constructing their own sentences. The value in knowing or being aware of these central semantic configurations for individual prepositions is that we can assist children to develop further understandings of non-typical configurations of prepositions. There is also raised awareness of the kinds of interpretations children are making in response to requests or during interactions with others. The success of any intervention program will depend on the social interaction and the role that others have in promoting language acquisition (Vygotsky, 1962). It should aim to teach within the child's developmental level and must include pragmatic strengthening from adult verbal interactions, modelling and support. Intervention aims to reduce possibilities that children with SLI will continue to have difficulties with language later in life that can impact on the child's cognitive, social and educational development.

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Appendix A

Objects provided to participants in the initial prototype

Circular cookie cutter (7cm diameter x 2.5. cm depth)	
Plastic circular container (Height 8cm x 10.5 cm in diameter)	
Blue matching screw on lid (11 cm diameter x 1.5 cm depth)	
A small plastic toy (A mouse standing upright dressed as an astronaut, 4 cm height)	
A plastic Lego door (Plastic frame with hinged door (2 cm x 4 cm x 5 cm)	
2 x pieces of Duplo (3cm x 2 cm)	

Initial Protocol for Prototype

Toy Mouse:

Position objects left to right directly in front of the participant as per the following plan:

| Duplo Block | Container | Cookie Cutter | Duplo Block | Lid | Lego Door |

Sit the child at a small table. The researcher sits next to the child	The researcher needs to be exposed to the same perspective as the participant and eliminating the possibility of the child demonstrating prepositions using the perspective of the researcher
Arrange the objects on the table as per plan	Particular order of placement of the objects to avoid suggestions of any relationships between objects
Give the child the toy mouse to hold	To reduce the possibility of the researcher inadvertently suggesting some relationship between the target object (toy mouse) and other objects on the table due to proximal placement
Tell the child: "You are able to touch and use any of the objects on the table or the mouse"	Explicit permission to manipulate the objects.
Prompt the child: 1. Say: "Put the mouse **in** something"	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position.	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant.
Give the child the toy mouse to hold.	

|	
Prompt the child: 2. Say: "Put the mouse **<u>behind</u>** something"	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Give the child the toy mouse to hold.	
Prompt the child: 3. Say: "Make the mouse **<u>over</u>** something"	Do not make eye contact with the child while the child is manipulating objects.
Replace all the objects back to the original position.	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Give the child the toy mouse to hold.	
Prompt the child: 4. Say: "Make the mouse go **<u>through"</u>**	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position.	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant.
Give the child the toy mouse to hold.	
Prompt the child: 5. Say: "Put the mouse **<u>in front</u>** of something"	Do not make eye contact with the child while the child is manipulating objects.
Replace all the objects back to the original position.	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Give the child the toy mouse to hold.	
Prompt the child: 6. Say: "Put the mouse **<u>under</u>** something"	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to

	avoid influencing the participant
Give the child the toy mouse to hold.	
Prompt the child: 7. Say: "Put the mouse **between**"	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Give the child the toy mouse to hold.	
Prompt the child: 8. Say: "Put the mouse **next to** something"	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Give the child the toy mouse to hold.	
Prompt the child: 9. Say: "Put the mouse **on** something"	Do not make eye contact with the child while the child is manipulating objects
Thank the child	

Note. No time limit is stipulated for each response. Verbal prompts may be repeated if necessary. After each prompt the researcher is to wait and use intuitive judgement to recognise when the child had finished moving or placing objects.

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Appendix C

The researcher had originally listed set criteria for children to meet when they responded to the prompts by manipulating objects in Stage 1 - the prototype. Acquisition of the features listed in the set criteria related to individual prepositions was deemed as 'demonstrated understanding or comprehension' as determined by the child being able to independently place objects to show spatial understanding of a given preposition if placement or movement of the mouse or other objects was deemed 'correct' as determined by the researcher in relation to the set criteria. The researcher observed and determined the features or actions demonstrated by participants in the prototype while referring to and assessing against the fixed set criteria of features for each preposition (Table 1).

Table 1. *Criteria for Marking Prepositions 'Correct' or 'Incorrect' Used in the Initial Prototype*

Preposition	Placement or movement criteria
On	The mouse is touching another object
In	The mouse is touching another object and the sides of the mouse (with or without the top of the mouse) are surrounded
Under	The mouse is covered by another object – can be touching or not touching
Over	The mouse is above another object – can be touching or not touching, moving or not moving
Behind	The mouse is placed in a vertical plane to another object
In front of	The mouse is placed in a vertical plane to another object
Between	The mouse is placed in the middle of two other objects
Next to	The mouse is placed close another object
Through	The mouse is moved all the way from one side of an object that has a central space to the another side or two objects are placed and the mouse is moved between and past the object on either side
Around	The mouse circumnavigates another object or is turned/spun

This data was collated and added to an Excel spreadsheet for processing and sorting and a review of the findings are presented as descriptive statistics (Table 2).

Table 2.

Children Age 4 to 5 Years Showing Typical Language Development Performance Against Initial Protocol

Preposition Feature Criteria

Participant No	On	Behind	Under	In Front of	Around	Next to	Over	Through	Between	Total Prepositions
6	1	1	1	1	1	1	1	1	1	10
12	1	1	1	1	1	1	1	1	1	10
14	1	1	1	1	1	1	1	1	1	10
17	1	1	1	1	1	1	1	1	1	10
25	1	1	1	1	1	1	1	1	1	10
31	1	1	1	1	1	1	1	1	1	10
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7	1	1	1	1	1	1	1	1	0	9
11	1	1	1	1	1	1	1	1	0	9
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4	1	1	1	1	1	1	0	0	0	7
19	1	1	1	1	1	0	0	1	0	7
8	1	1	0	1	1	0	0	0	0	5
	33	33	32	32	31	29	28	26	9	

Notes. A [1] denotes those children who demonstrated the features of the preposition word as listed in the criteria.
A [0] denotes that the features were not demonstrated for this preposition as listed in the criteria.

In only recording the responses in relation to the criteria this potentially meant that important information may have been neglected to be collected. This threat to internal validity was not apparent before the prototype was conducted. However, the trial of the protocol and conducting the prototype was an integral component of this study and impacted on how the study unfolded. The criteria of features and placement of objects set by the researcher in the initial prototype that suggested 'correct' or 'incorrect' responses from child participants were removed. Semantic features and the configuration of those components that children understood rather than what the researcher expected about a particular preposition was the focus of this study.   The criteria of features for each preposition listed only those features the researcher believed should be demonstrated to show understanding of each preposition. The data provided some point of reference as to the understandings children had related to prepositions but it only served to create a determinist view of preposition features understood only by the researcher. The data related to children's performance as measured against this set criteria for each preposition provided some information but in isolation it certainly did not give a complete view of the features the children understood and demonstrated.

While conducting the individual demonstration sessions in the prototype it quickly became evident that some features demonstrated by the child participants were not listed in the preset criteria. For example, Table 1 showed that 6 of the 33 children included in the prototype correctly demonstrated or matched the expected configuration of features related to all ten of the prepositions as stated in the criteria. During the trial demonstrations these children did display features the researcher had listed and expected them to display but this was often done in conjunction with demonstrating many other 'unexpected features' or configurations. For example the children often placed one object next to another in response to the prompt 'next to' but the criteria did not specify if contact was made between objects or give the orientation between objects such as an target object placed next to but in a projective position. The data collected from participants in the prototype raised more questions related to the semantic features the children demonstrated than it answered.

Field notes and observations had been recorded during the prototype demonstrations and these were then able to be collated and sorted giving a list of features observed. It was these additional supplementary features that served to really expand and define the researcher's understanding about what the child participants

understood related to the prepositions. This became particularly important when upon close analysis it became apparent that some of these unlisted features were common within the peer group. It is this data that has been presented and discussed in this thesis.

The data collected from children age 4 to 5 years showing typical language development (TLD) in the initial prototype showed the participants performance against a preset criterion for each target preposition. The data related to the set criteria is included purely to demonstrate the process of the research and the importance of allowing the data to emerge from the actions of the participants rather than predetermining it using researcher expectations. Importantly the prototype, the trial of the initial protocol and objects made available to the children in the trial enabled constructive changes to be made to the main study. The prototype or trial allowed the researcher to evaluate the initial protocol. The whole process and the subsequent revision to the language and presentation of the protocol served to increase and greatly enhanced the validity and accuracy of the data collected in the main study.

On reflection the criteria set for use in the prototype was a rather vague and unsophisticated measure. Consequently the data recorded in Table 1 holds little value in relation to uncovering children's configuration of semantic features related to prepositions and needs to be rejected. This was especially so in light of the detailed array of features observed by the researcher in response to prompts that were demonstrated by the children who later participated in the main study.

Objects provided to participants in Stage 2 of the final study

Plastic hoop (inner diameter of 12 centimetres, the outer diameter was 16 centimetres, giving the hoop a 2 centimetre rim that was 1 centimetre deep),	
Plastic circular container (Height 8cm x 10.5 cm in diameter)	
Lid (11 cm diameter x 1.5 cm depth)	
2 x wooden blocks (2.5 cm x 2.5 cm x 5 cm)	

Appendix E

Main Study Protocol

Position objects left to right directly in front of the participant as per the following plan:
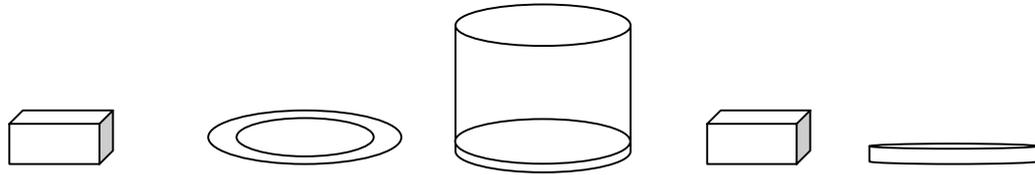
Wooden block	Hoop	Plastic container	Wooden block	Lid

Sit the child at a small table. The researcher sits next to the child.	The researcher needs to be exposed to the same perspective as the participant and eliminating the possibility of the child demonstrating prepositions using the perspective of the researcher
Arrange the objects on the table as per plan.	Particular order of placement of the objects to avoid suggestions of any relationships between objects
Tell the child: I am going to say some words and I want you to show me what you know. You are able to touch and use any of the objects in the room, on the table or use yourself.	Explicit permission to manipulate the objects
Prompt the child: 1. Say: "**In**"	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position.	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant.
Prompt the child: 2. Say: "**Under**"	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Prompt the child:	Do not make eye contact with the child while the child

3.Say: **"In front"**	is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Prompt the child: 4. Say: **"Between"**	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position.	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant.
Prompt the child: 5. Say: **"Through"**	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Prompt the child: 6. Say: **"Under"**	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Prompt the child: 7. Say: **"Next to"**	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Prompt the child: 8. Say: **"Across"**	Do not make eye contact with the child while the child is manipulating objects

Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Prompt the child: 10. Say: **"Behind"**	Do not make eye contact with the child while the child is manipulating objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Prompt the child: 11.Say: **"Around"**	Do not make eye contact with the child or any of the objects
Replace all the objects back to the original position	No feedback to be given to the children about movement or placement of objects. Approach each demonstration with the original placement of objects to avoid influencing the participant
Prompt the child: 13. Say: **"On"**	Do not make eye contact with the child while the child is manipulating objects
Thank the child	

Note. No time limit is stipulated for each response. Verbal prompts may be repeated if necessary. After each prompt the researcher is to wait and use intuitive judgement to recognise when the child has finished moving or placing objects.

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Trial Adult Instrument Images
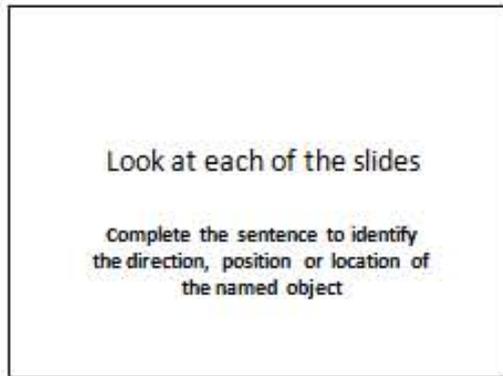
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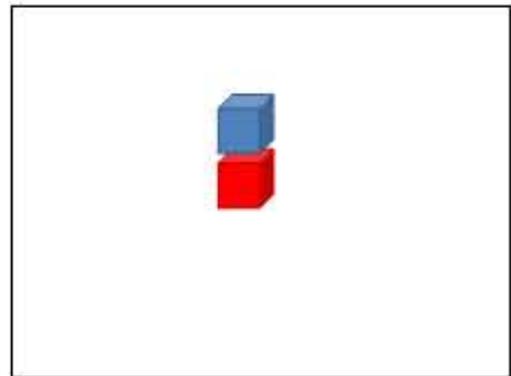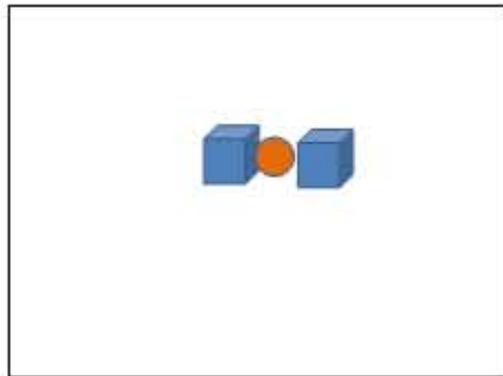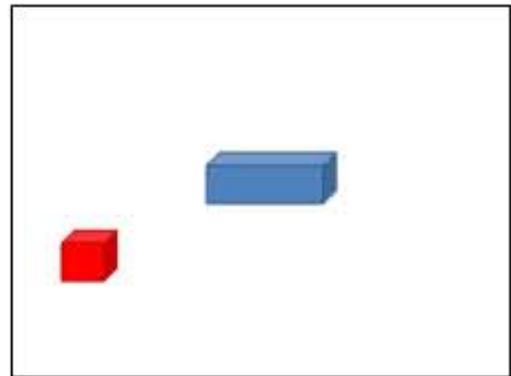
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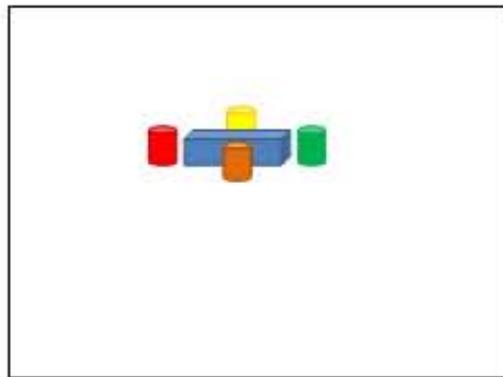
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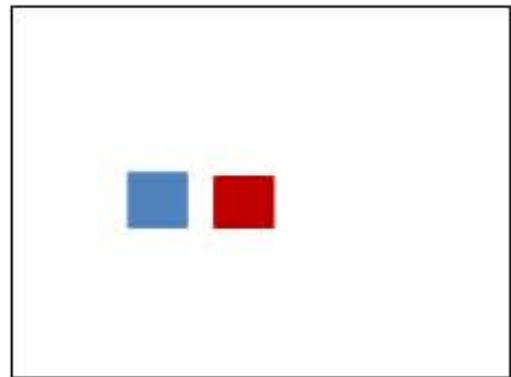
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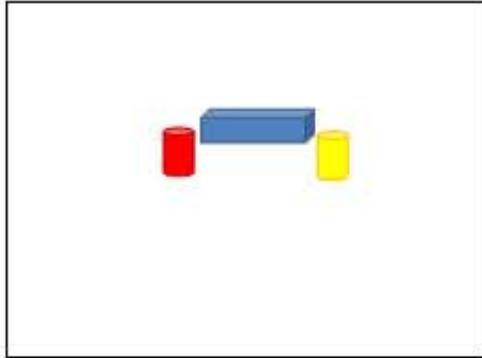
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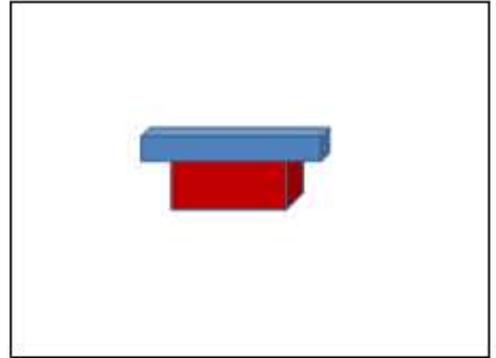
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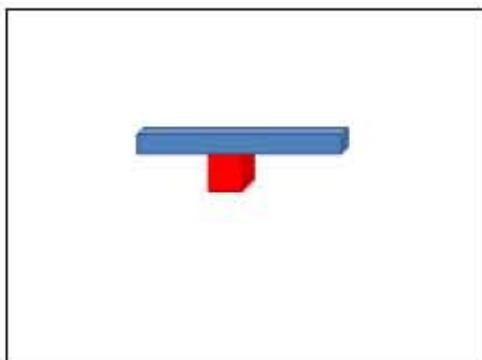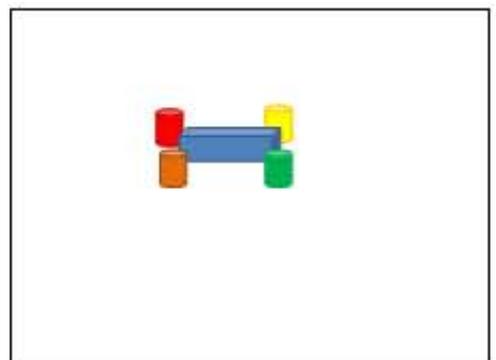
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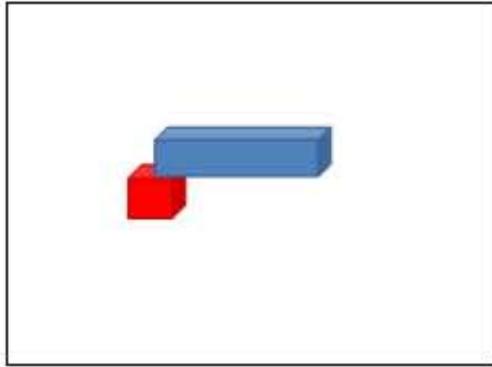
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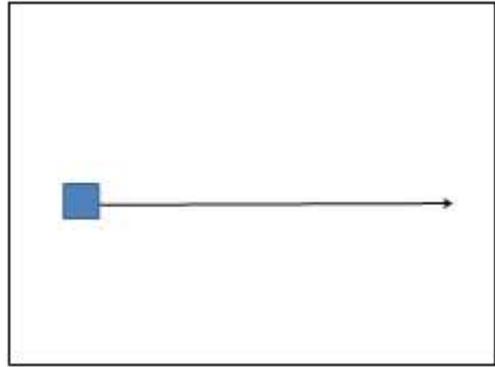
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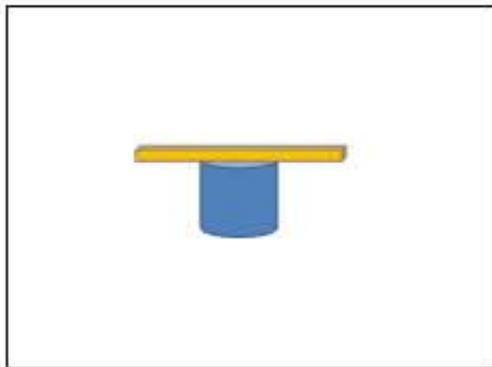
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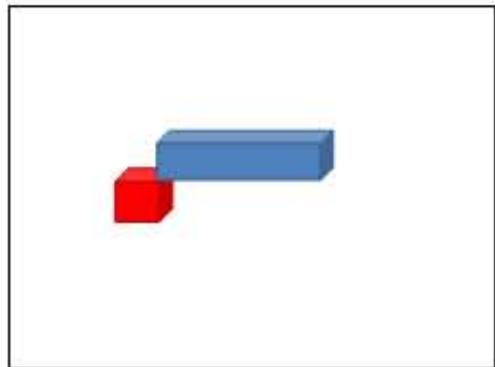
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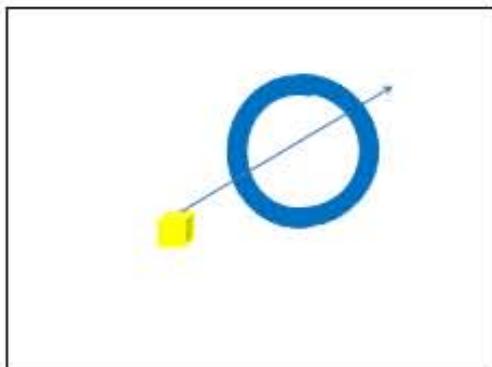
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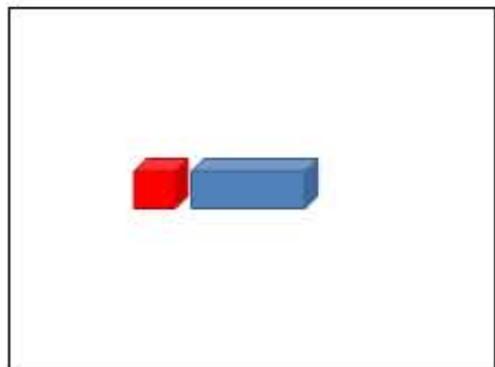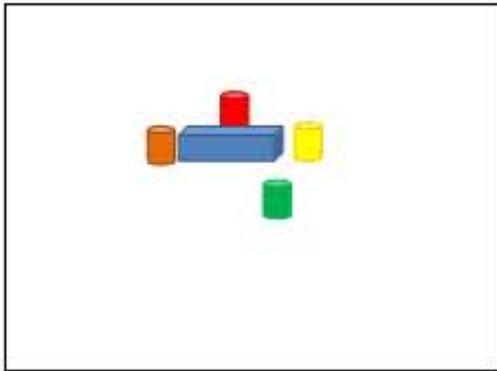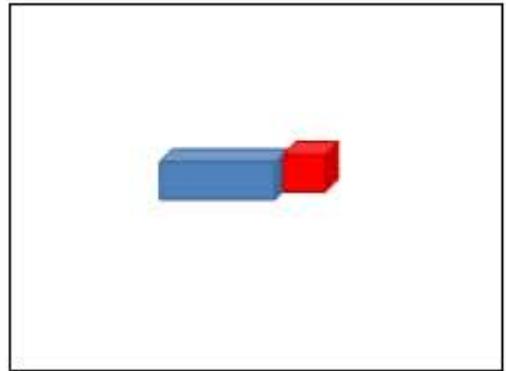
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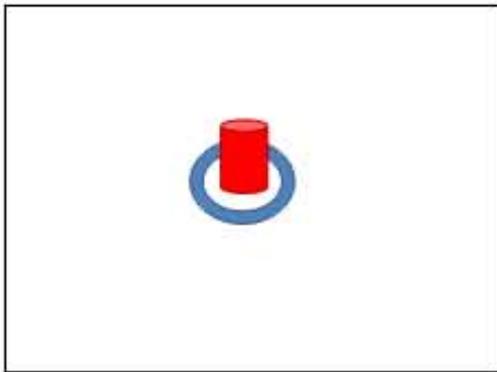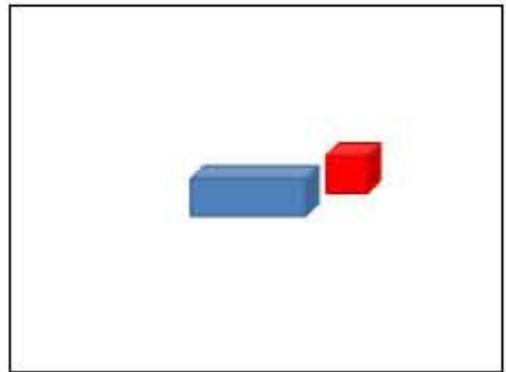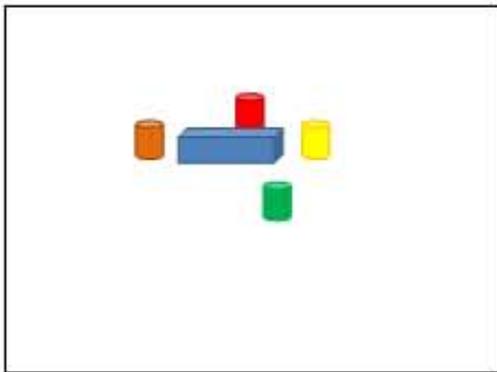

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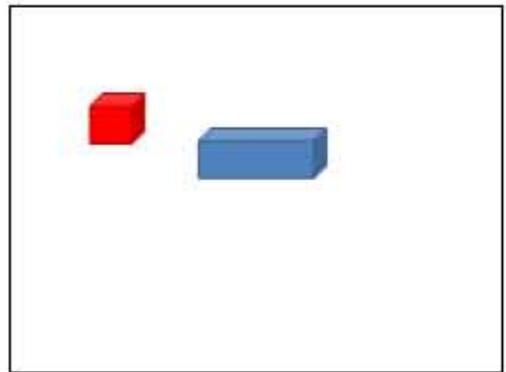
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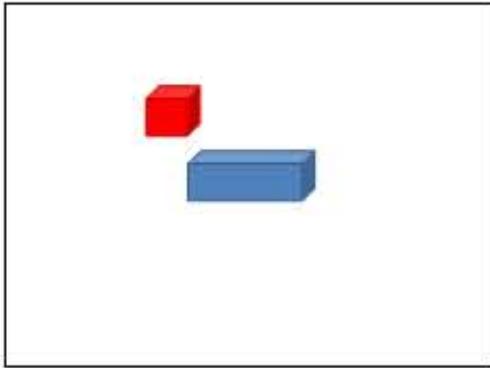
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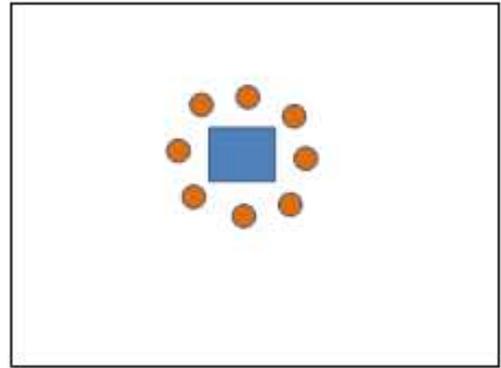
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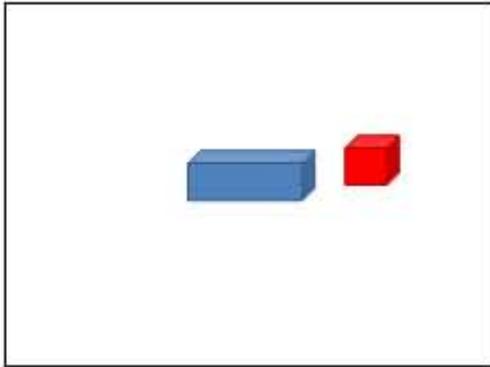
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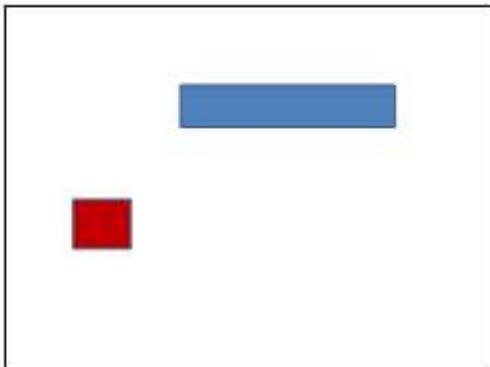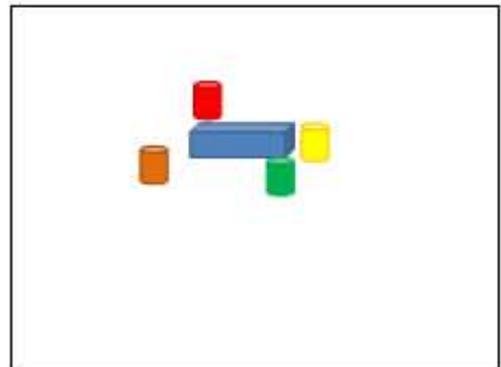
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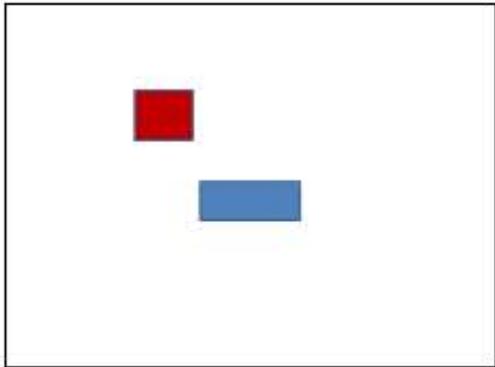
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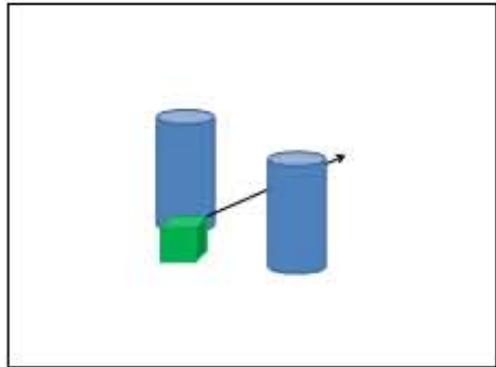
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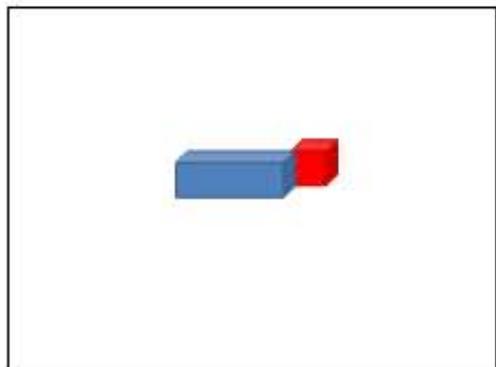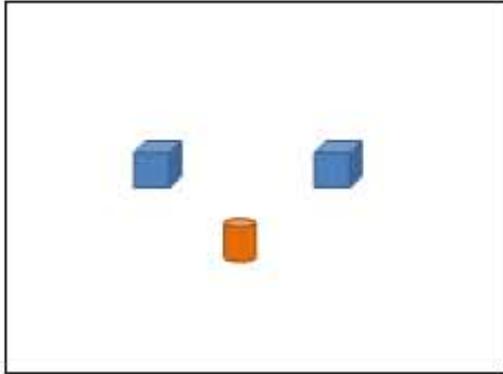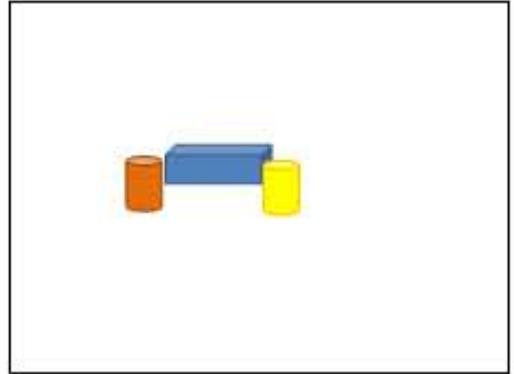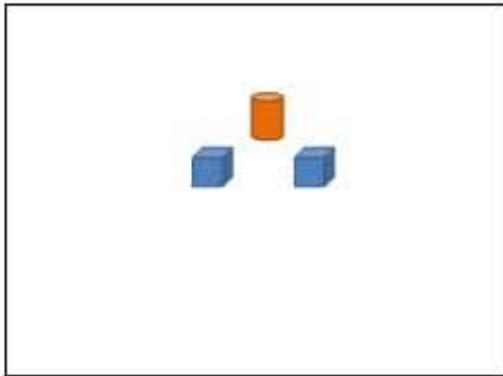
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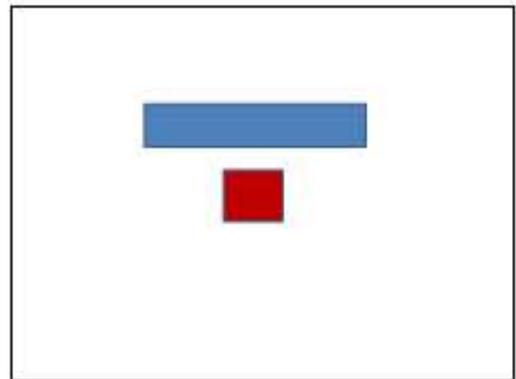
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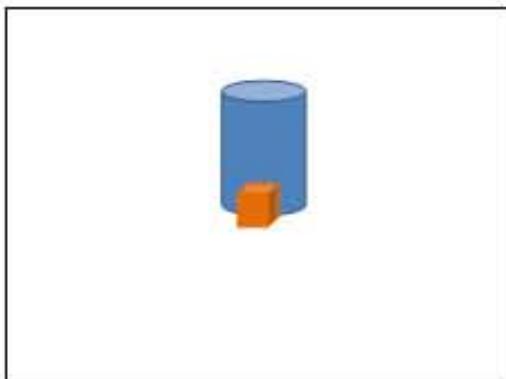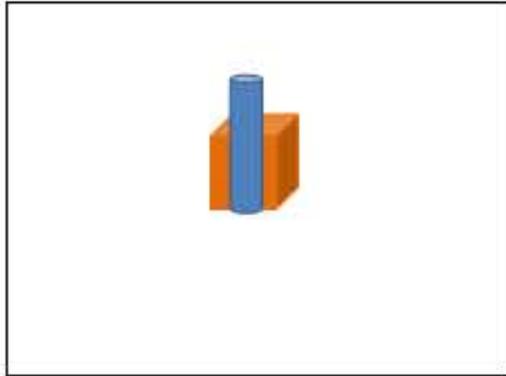
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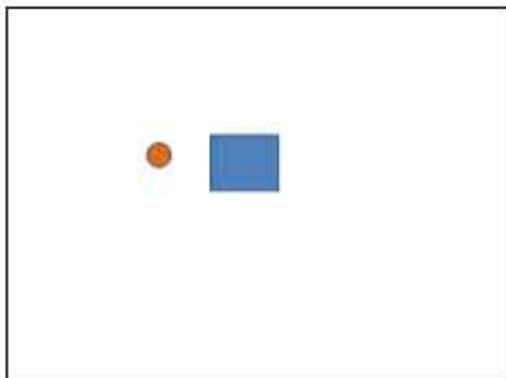
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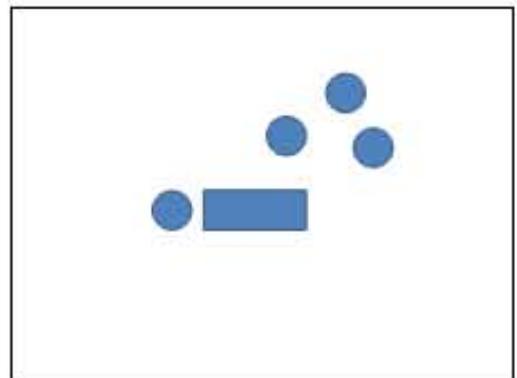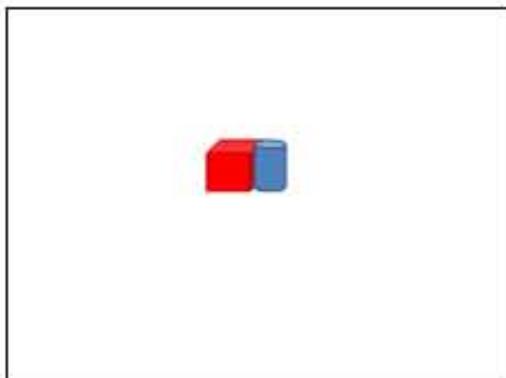
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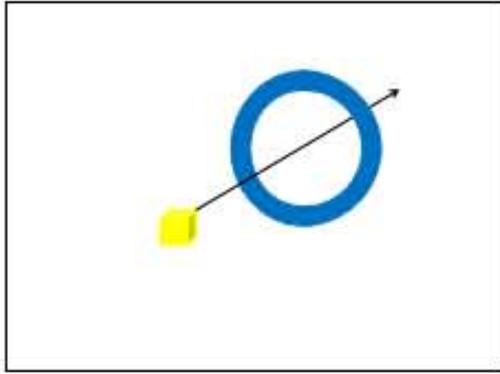
Image 52

Image 53

Image 54
Animated Image

Final Image

Appendix G

Trial Adult Instrument Response Sheet

Complete the sentence to identify the direction, position or location of the named object.

Please identify if you are: Male: ☐   or   Female: ☐

Please identify which age group you belong:
18-24 ☐   25-34 ☐   35-44 ☐   45-54 ☐   55-64 ☐   Over 65 ☐
Complete the sentence
1. The blue shape
2. The orange shape
3. The red shape
4. The blue shape
5. The blue shape
6. The blue shape
7. The red shape
8. The ball
9. The blue shape
10. The red shape

11. The blue shape
12. The red square
13. The blue square
14. The yellow shape
15. The red shape
16. The yellow shape
17. The blue shape
18. The red shape
19. The red shape
20. The red shape
21. The red shape
22. The blue shape
23. The red shape
24. The red shape
25. (Write a sentence to describe what you see)

26. The red shape
27. The green shape
28. The red shape
29. The blue shape
30. The red shape
31. The green shape
32. The green shape
33. The red square
34. The green shape
35. The red shape
36. The orange shape
37. The blue shape
38. The orange shape
39. The green shape
40. The green shape
41. The blue shape

42. The orange shape
43. The blue shape
44. The green shape
45. The red shape
46. The orange shape
47. The blue shape
48. The blue shape
49. The blue shape
50. The orange shape
51. The orange rectangle
52. The blue shape
53. The blue shape
54. The yellow shape

Appendix H

Adult Instrument Images

Look at each of the slides

What words would you use to describe the position or movement of the named objects? You can use as many words as you feel is necessary. Please do not use "left", "right", or compass reference points. If you do not feel that there is an immediate or clear relationship to the other objects please write "pass".
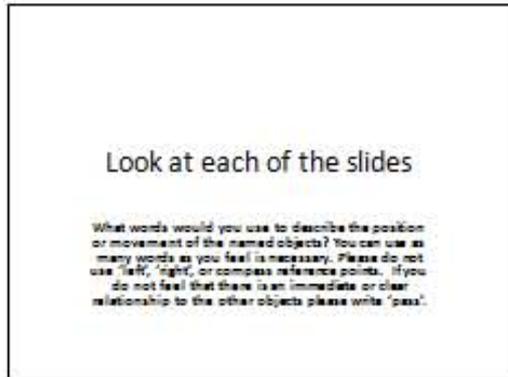
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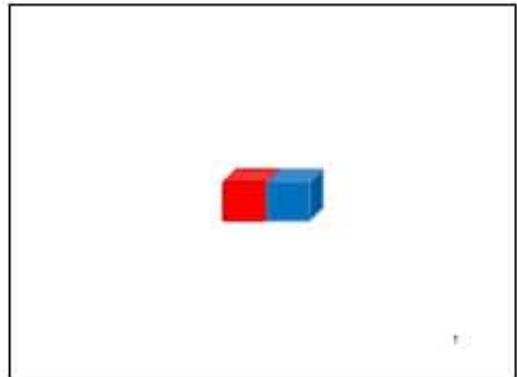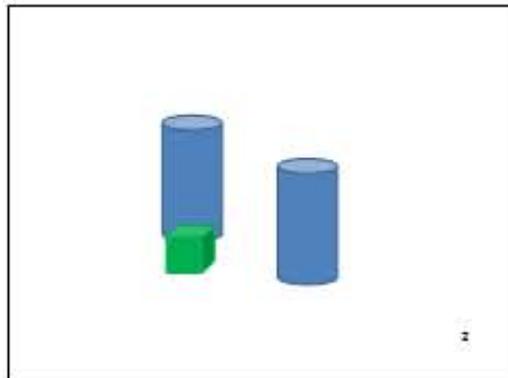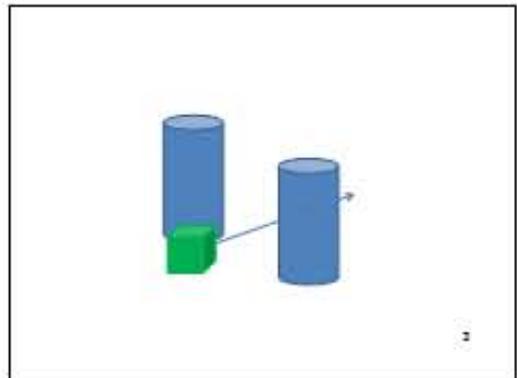
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Image 2

Image 3
Animated Image

Image 4

Image 5

272
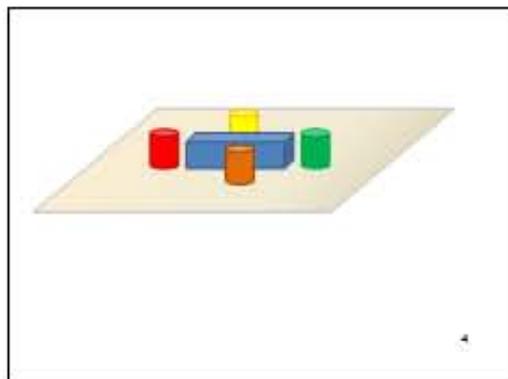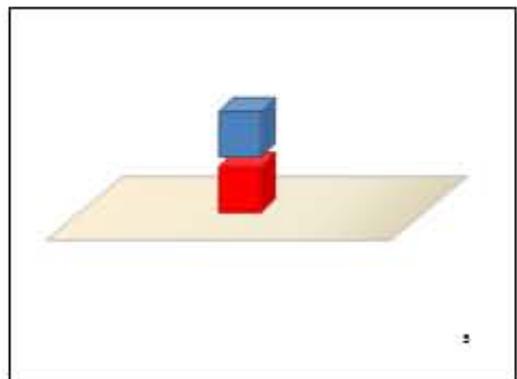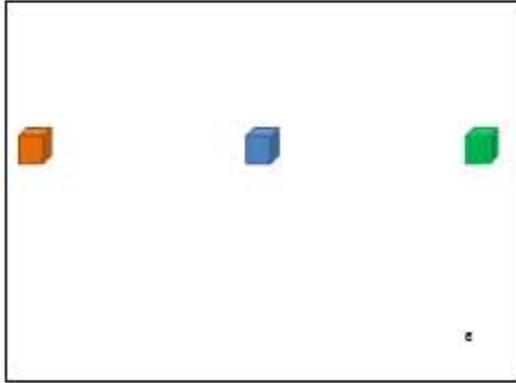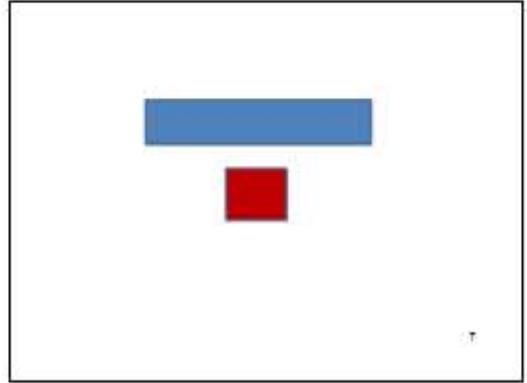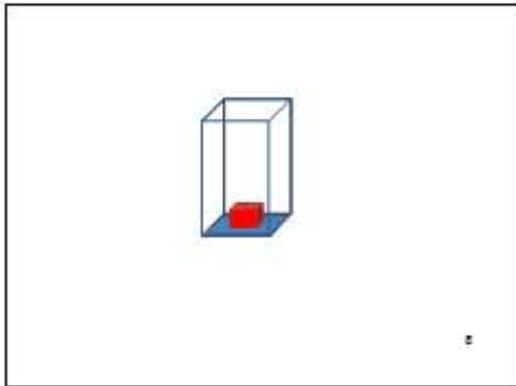
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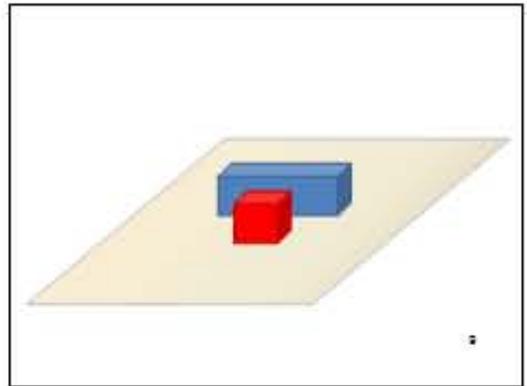
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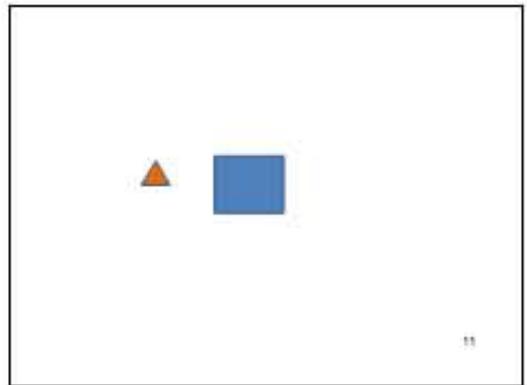
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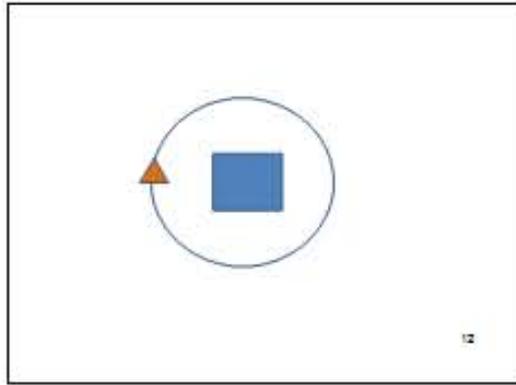
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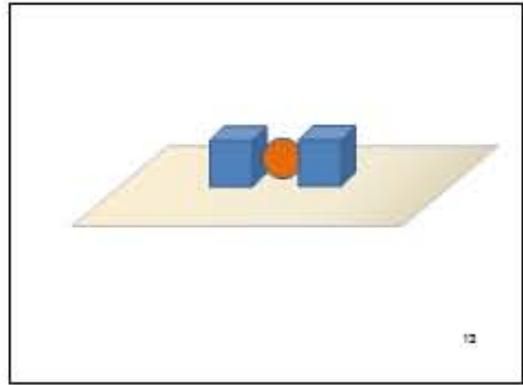
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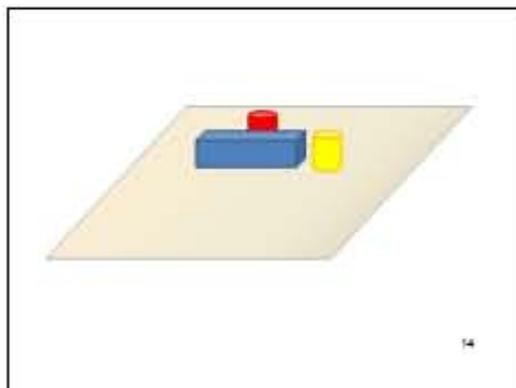
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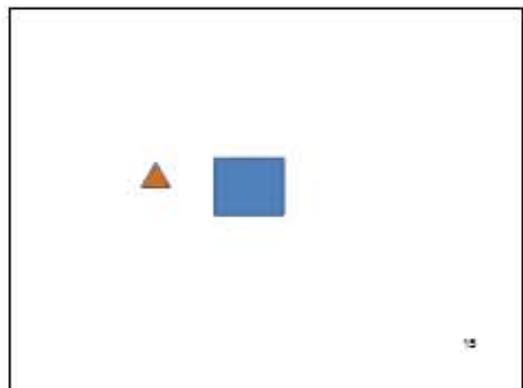


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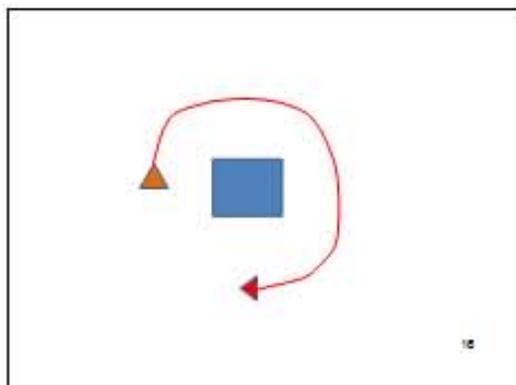
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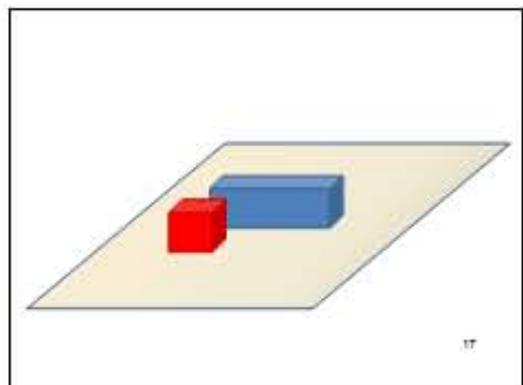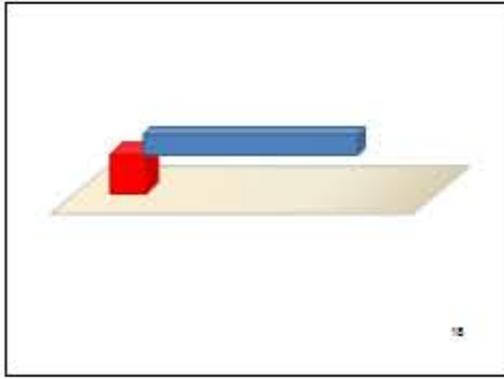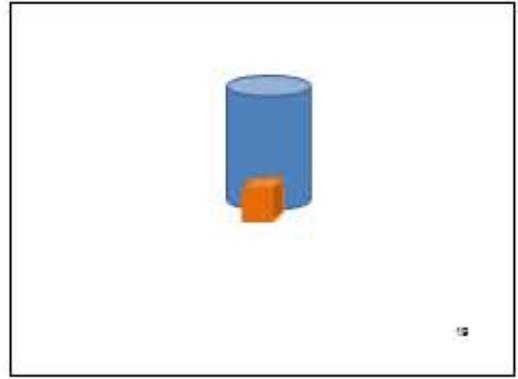
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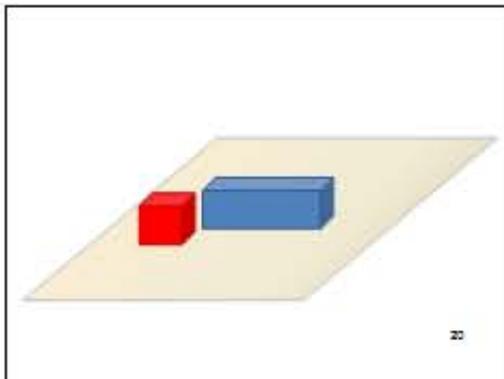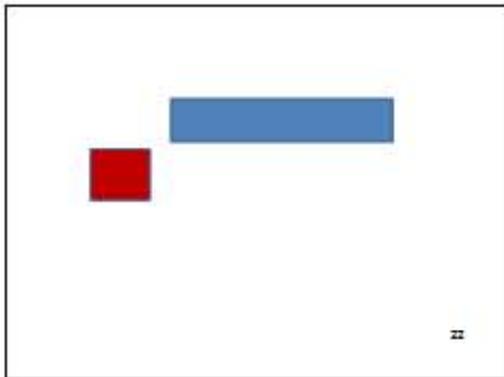
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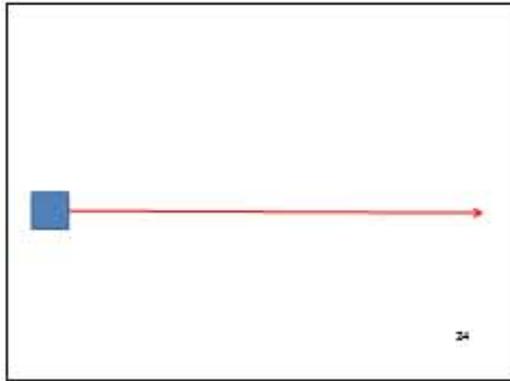
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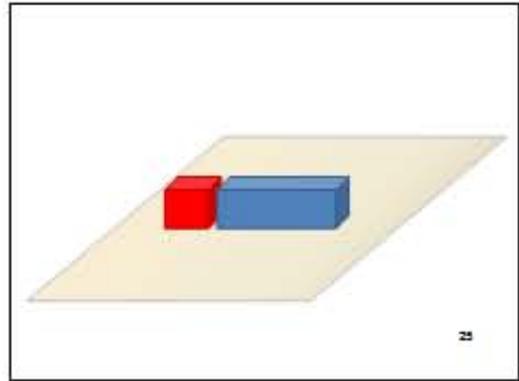
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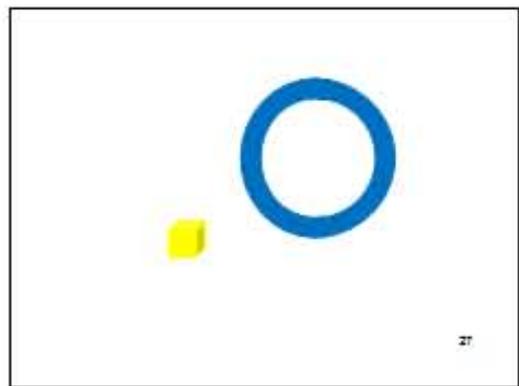
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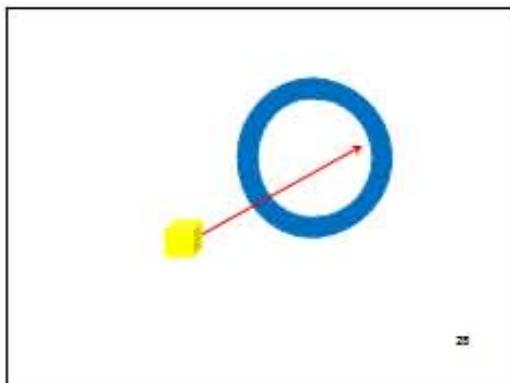
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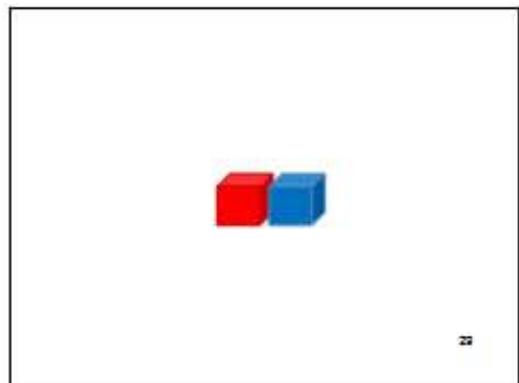
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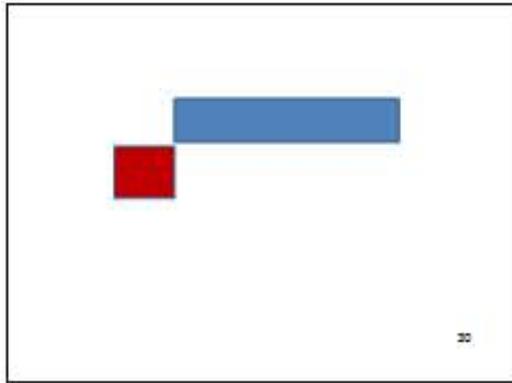
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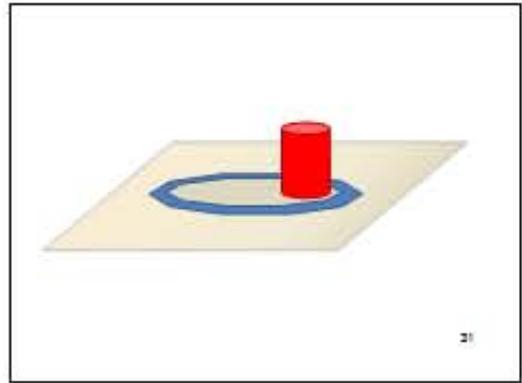
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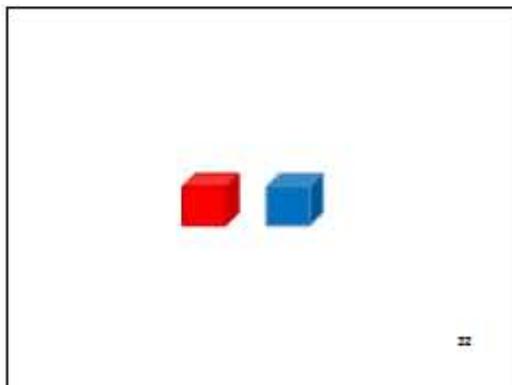
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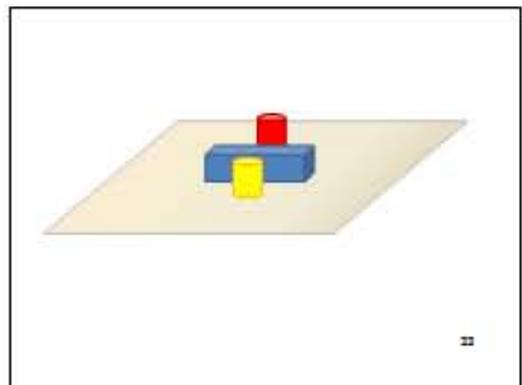
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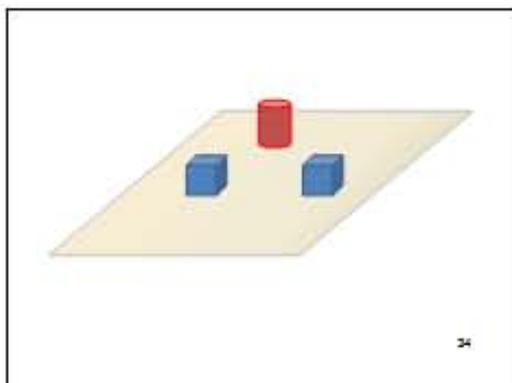
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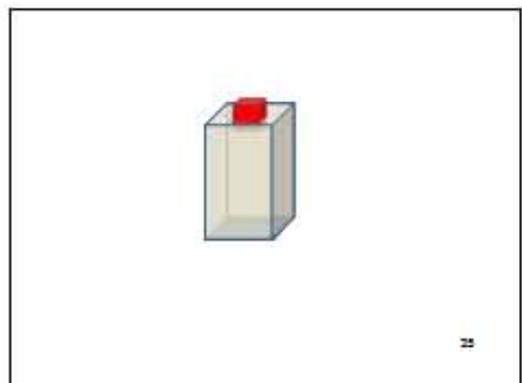
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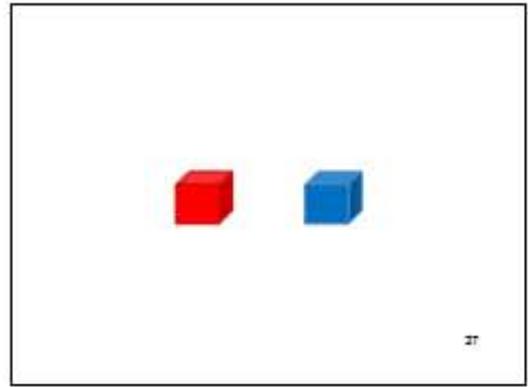
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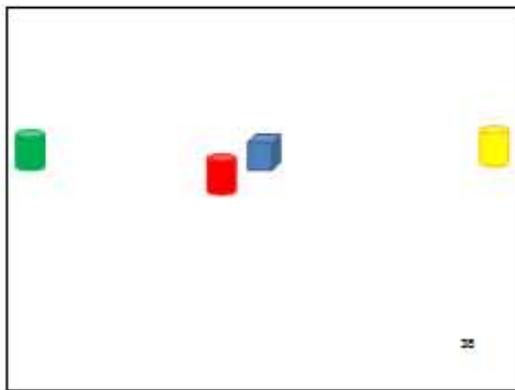
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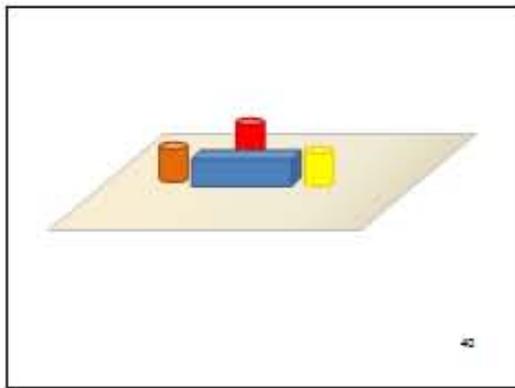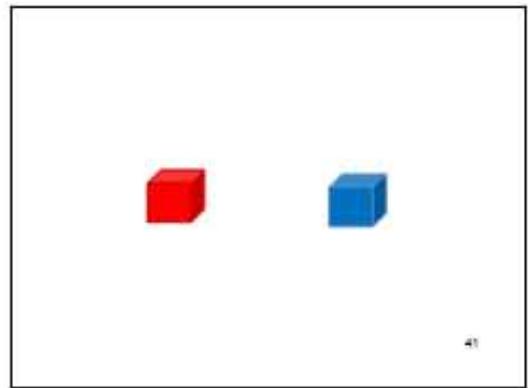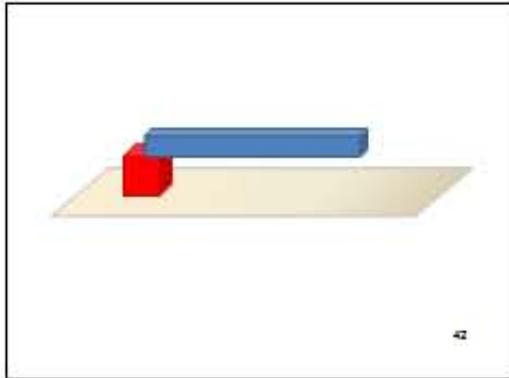
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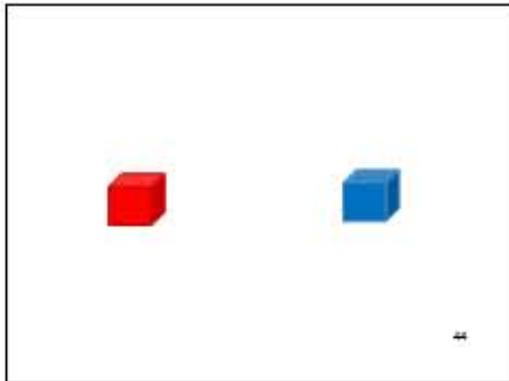
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Image 46

Image 47

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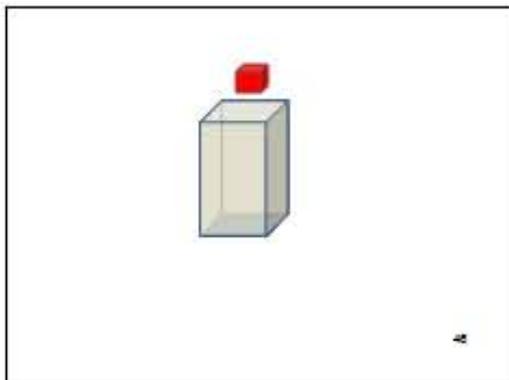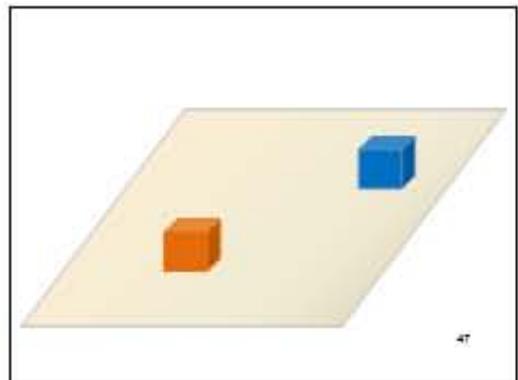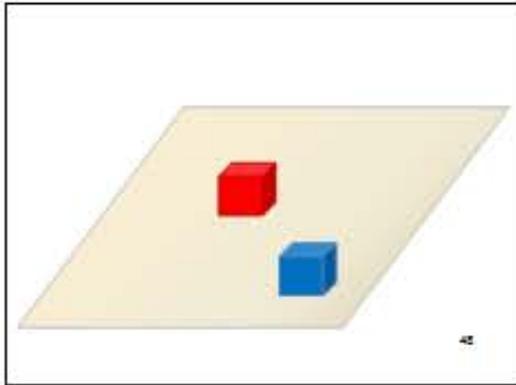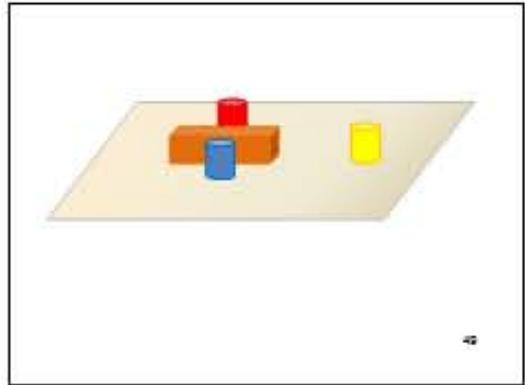
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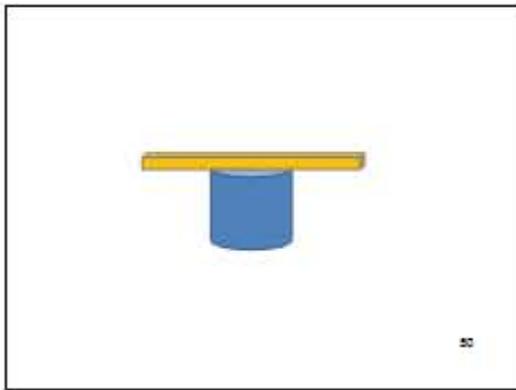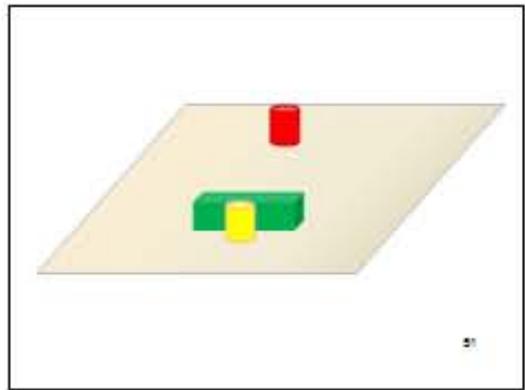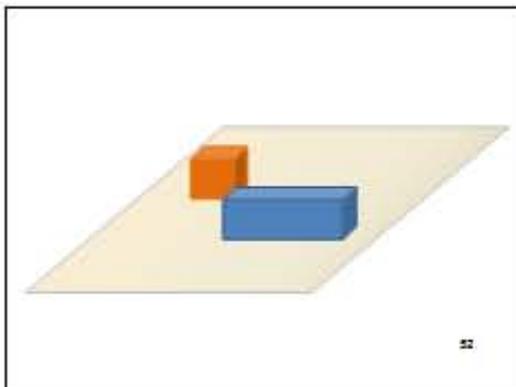
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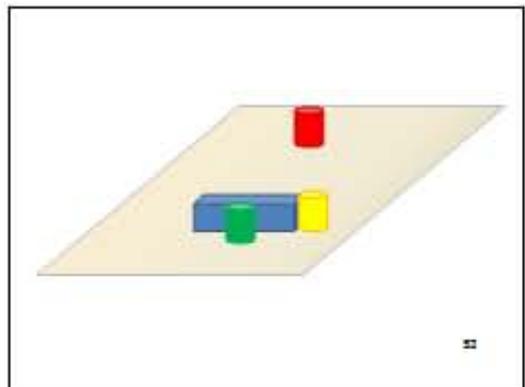
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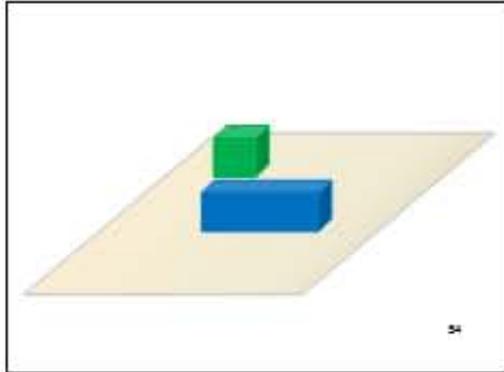
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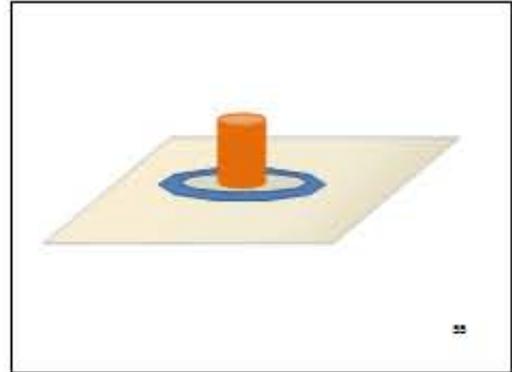
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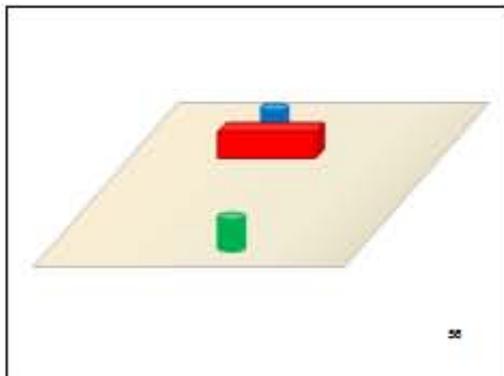
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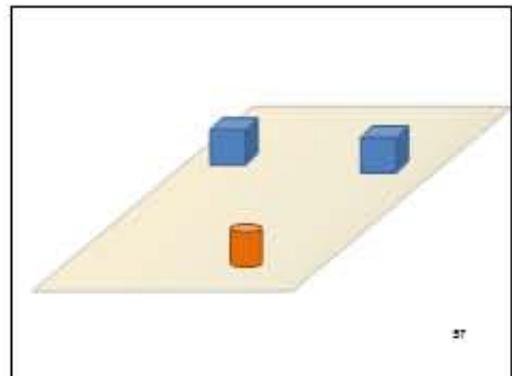
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Image 58

Image 59

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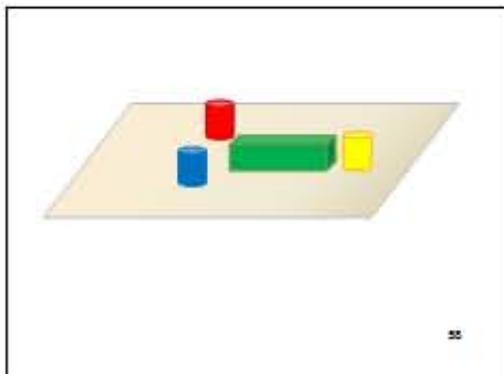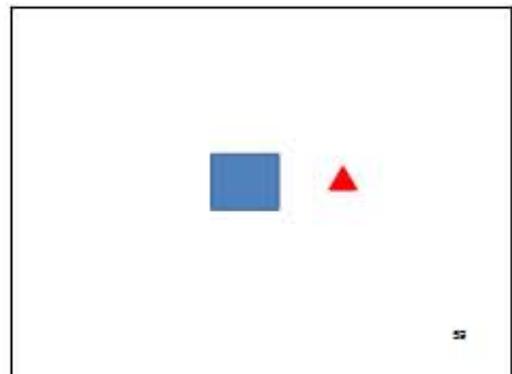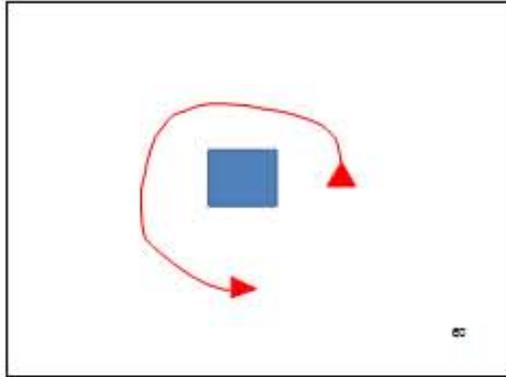
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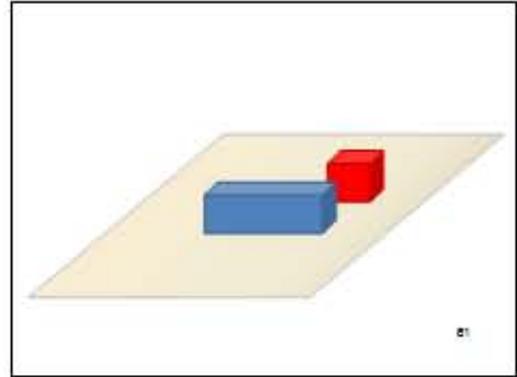
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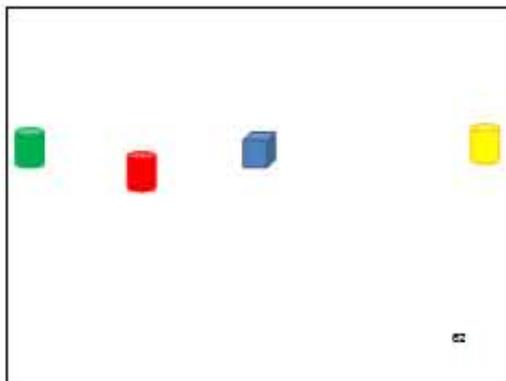
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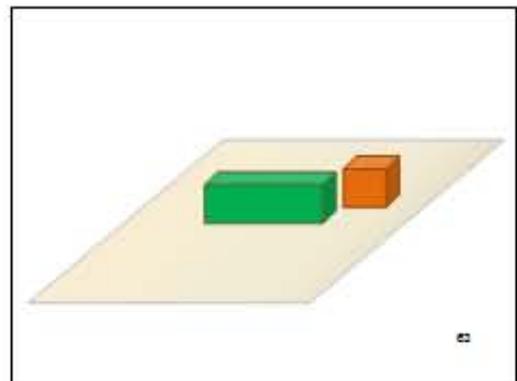
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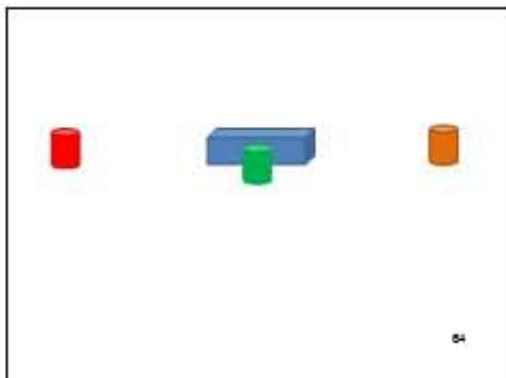
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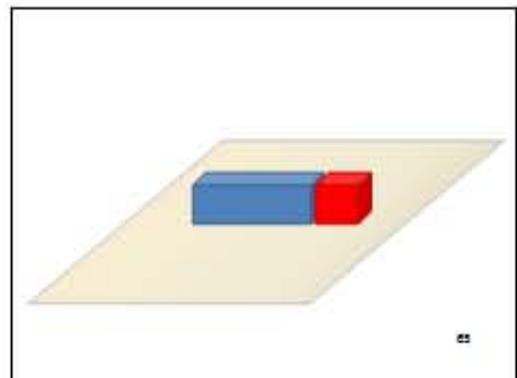
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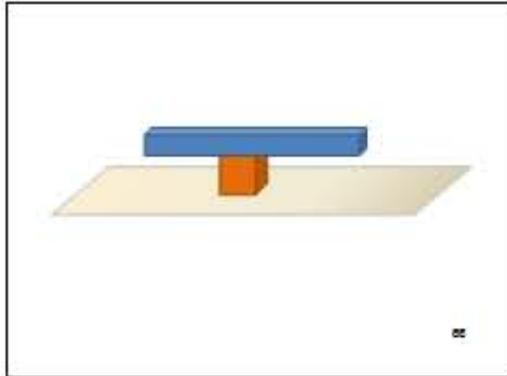
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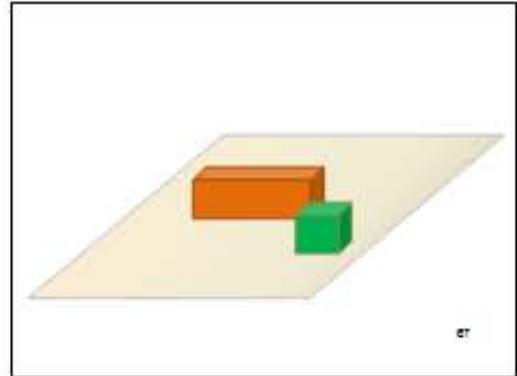
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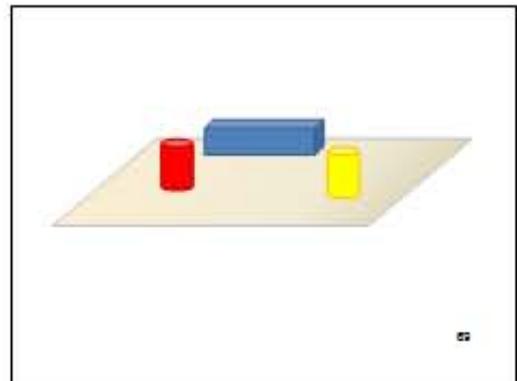
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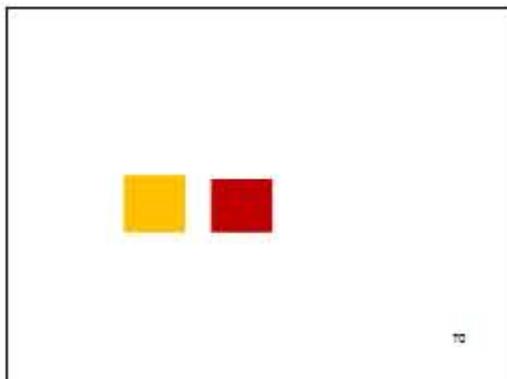

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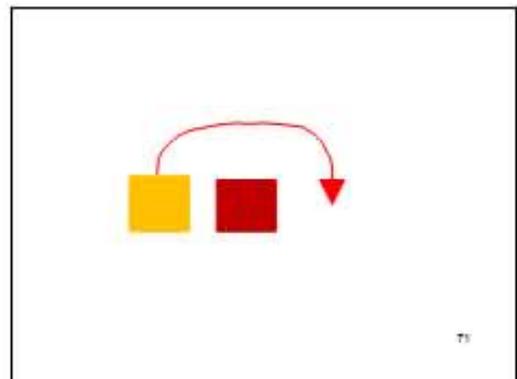
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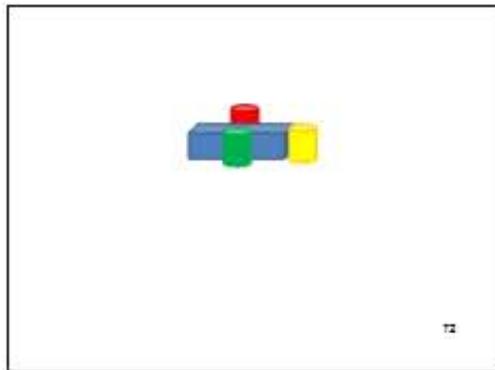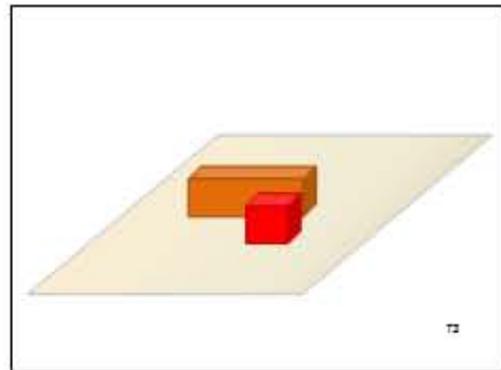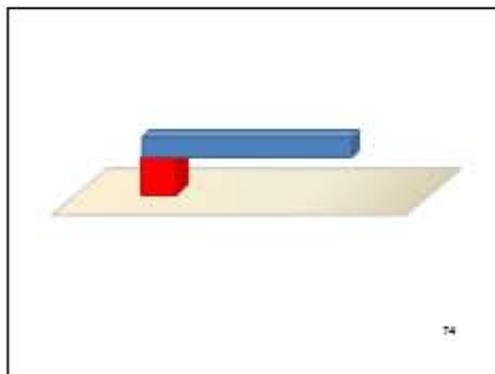
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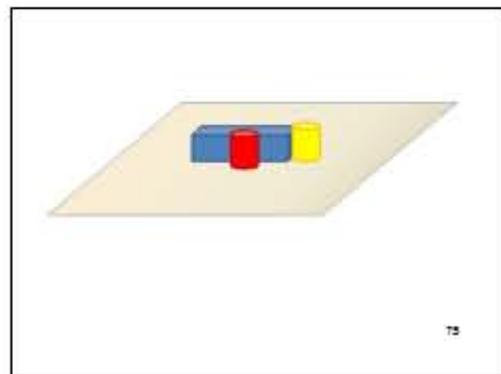
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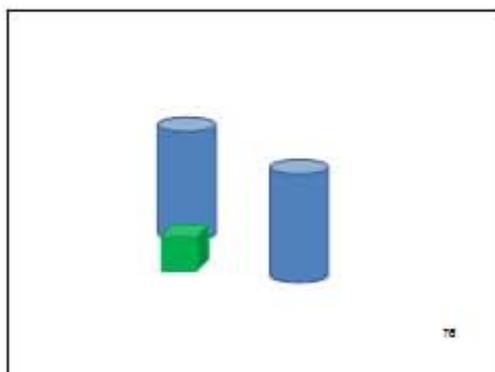
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Image 77
Animated Image

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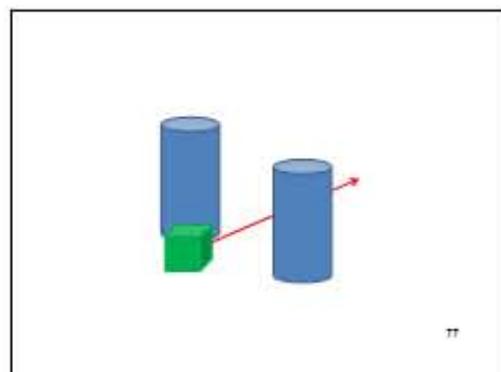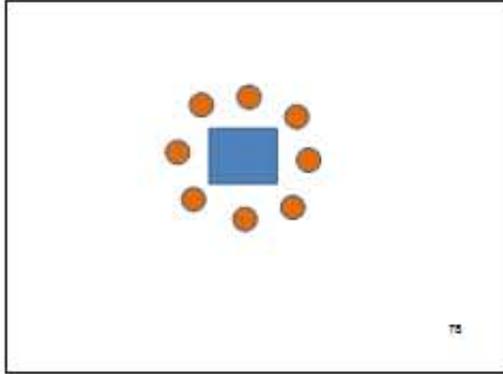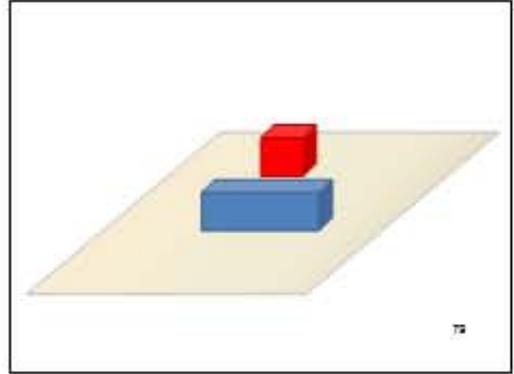
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Image 79

Image 80

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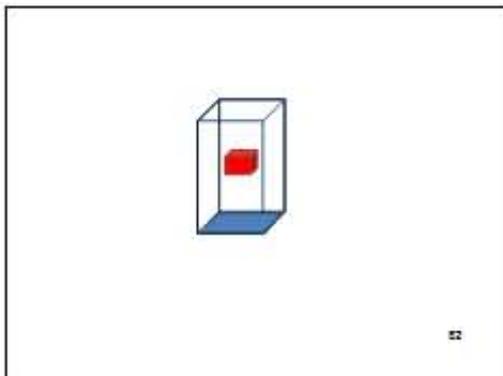
Image 82

Final Slide

Curtin University of Technology

Adult Instrument Response Sheet

What words would you use to describe the position or movement of the named objects? Please do not describe the function of the objects or what you think the object is capable of doing, just the actual position or location as seen in relation to the other objects. You can use as many words as you feel is necessary. Please do not use 'left' or 'right' or use compass reference points. If you do not feel that there is an immediate or clear relationship to the other objects please write 'pass'.

Please identify if you are: Male: ☐   or   Female: ☐

Please identify which age group you belong:
18-24 ☐   25-34 ☐   35-44 ☐   45-54 ☐   55-64 ☐   Over 65 ☐
Complete the sentence
1. The red shape
2. The green shape
3. The green shape
5. The red shape
6. The blue shape
7. The blue shape
8. The red shape
9. The red shape
10. The green shape

11. The orange shape
12. The orange shape
13. The orange shape
14. The blue shape
15. The orange shape
16. The orange shape
17. The red shape
18. The red shape
19. The orange shape
20. The red shape
21. The green shape
22. The red shape
23. The blue shape
24. The blue shape
25. The red shape
26. The green shape

27. The yellow shape
28. The yellow shape
29. The red shape
30. The red shape
31. The red shape
32. The red shape
33. The blue shape
34. The red shape
35. The red shape
36. The green shape
37. The red shape
38. The blue square
39. The blue shape
40. The blue shape
41. The red shape
42. The red shape

43. The blue shape
44. The red shape
45. The green shape
46. The red shape
47. The orange shape
48. The red shape
49. The orange shape
50. The yellow shape
51. The green shape
52. The orange shape
53. The blue shape
54. The green shape
55. The orange shape
56. The red shape
57. The orange shape
58. The green shape

59. The red shape
60. The red shape
61. The red shape
62. The blue shape
63. The green shape
64. The blue shape
65. The red shape
66. The orange shape
67. The green shape
68. The orange shape
69. The blue shape
70. The yellow shape
71. The yellow shape
72. The blue shape
73. The red shape
74. The red shape

75. The blue shape
76. The green shape
77. The green shape
78. (Write a sentence to describe what you see).
79. The red shape
80. The orange shape
81. The orange shape
82. The red shape

Appendix J

Adult Reponses to the Images in the Adult Instrument

Slide	Preposition	Significant phrases	Number of responses	Percentage of participants	Other prepositions used with significant phrases	Number of responses	Percentage Of Response	Other responses	Number of non preposition responses	No response
1	Next to	-	22	68.75	Beside	10	31.25	-	-	0
2	In front	-	32	100	-	-	-	-	-	0
3	Between	-	30	93.75	-	-	-	- Past the other two - A bit at the back	1 1	0
4	In	- (In) the middle of	29	90.625	-	-	-	- Surrounded by - Circled by	2 1	0
5	Above	-	32	100	-	-	-	-	-	0
6	Between	-	26	81.25	In - (In) The middle of	6	18.75	-	-	0
7	Below	-	32	100	-	-	-	-	-	0
8	In	-	22	68.75	Inside	9	28.125	- At the bottom of	1	0
9	In front		32	100	-	-	-	-	-	0
10	On	- (On) the edge	32	100	-	-	-	-	-	0
11	Next to	-	30	93.75	Beside	2	6.25	-		0
12	Around	-	29	90.625	-	-	-	- Circled	3	0
13	Between	-	32	100	-	-	-	-	-	0
14	In front	-	28	87.5	Next to	4	12.5	-	-	0
15	Next to	-	27	84.375	Beside	5	15.625	-	-	0
16	Around	-	30	93.75	-	-	-	- ¾ way - Enveloped	1 1	0
17	In front	- (In front) and almost in line - (In front) and slightly over - (In front) of and the other side of - (In front) at the corner - Away from (the front) - (In front) but further round - (In front) and to the side a bit	32	100	-	-	-	-	-	0
18	Under	- (Under) Bottom corner -(Under) at the corner	20	62.5	Underneath Below On - (On) the bottom	5 2 2	15.625 6.25 6.25	-Supporting other shape	3	0

No.	Term	Variation	Count	%	Term 2	Count	%	Description	Count	Final
19	In front	-	32	100	-	-	-	-	-	0
20	In front	- (In front) to the side a bit - (In front) set forwards	17	53.125	Next to - (Next to) but further away - (Next to) at the corner	14	43.75	One side in line with the other shape	1	0
21	On	- (On) the edge - Balanced (on) - (On) the edge but falling	32	100	-	-	-	-	-	0
22	Below	- (Below) but over a bit - (Below) to the side	28	87.5	In front - (In front) but further away	2	6.25	-	-	2
23	On	- (On) the screen	21	65.625	-	-	-	- To the side - To the side of the screen	3 3	5
24	Across	- Moves (across)	27	84.375	-	-	-	Moves to the other side	5	0
25	Next to	-	30	93.75	-	-	-	Along side	2	0
26	On	- (On) the floor	30	93.75	Near	2	6.25	-	-	0
27	In front	- To the (front) - (In front) to the side - (In front) towards the side	6	18.75	Front	5	15.625	- Bottom of the screen - Outside the circle	14 3	4
28	Through	-	32	100	-	-	-	-	-	0
29	Next to	-	29	90.625	Beside	3	9.375	-	-	0
30	Below	-	28	87.5	Near - (Near) the corner Under - (Under) but to the side	1 2	3.125 6.25	-	-	0
31	Inside	-	25	78.125	On - (On) but to the side - (On) a shape - (On) to the edge	7	21.875	-	-	0
32	Next to	- (Next to) but further away - (Next to) but a bit apart - (Next to) but a bit away	32	100	-	-	-	-	-	0
33	Between	-	32	100	-	-	-	-	-	0

34	Above	- (Above) the others	28	87.5	Behind	4	12.5	-		0
35	On	- (On) top - (On) the centre top	10	31.25	In - (In) a bit At the top	5	15.625	-	-	0
36	Under	-	23	71.875	Underneath On - (On) the floor Near	5 3 1	15.625 9.375 3.125	-	-	0
37	Next to	- (Next to) but away from the other shape	8	25	-	-	-	- Towards the screen - Four times the distance from other shape	12 1	5
38	Between	-	20	62.5	Behind - (Behind) and to the side - (Behind) sort of In (In) the middle of the other two at the sides - (In) the middle - (In) the middle of the other shapes	6 6	18.75 18.75	-	-	0
39	Behind	-	24	75	In front	8	25	-	-	0
40	In front and between	-	22	68.75	Below - (Below) others in the foreground	2	6.25	Surrounded by other shapes	8	0
41	On	- (On) the screen - (On) the other side of the screen	3	9.375	-	-	-	- Away from the other shape - Towards the edge of the screen - Is the other side	11 8 5	5
42	Under	-	24	75	Underneath Below On	2 1 1	6.25 3.125 3.125	Supporting the other shape	4	0
43	Behind	-	32	100	-	-	-	-	-	0
44	On	- (On) the screen	4	12.5	-	-	-	- Other side of the screen - Towards the edge of the screen - Side of the screen - Away from the other shape	6 6 5	11

45	On	-	23	71.875	In - (In) the middle	9	28.125	-	-	0
46	Above	-	26	81.25	Behind - Sort of (behind) - (Behind) and to the top	6	18.75	-	-	0
47	In front	- (In front) to the side - (In front) set forwards - (In front) towards the edge of the screen - (In front) and down	17	53.125	Below Near - (Near) the bottom	10 3	31.25 3.125	-	-	2
48	Above	- (Above) and slightly across - Sort of (above)	23	71.875	Behind - Almost (behind) In - (In) the centre Up - (Up) from the other shape	6 2 1	18.75 6.25 3.125	-	-	0
49	Between	-	32	100	-	-	-	-	-	0
50	On	- (On) top of - (On) top	32	100	-	-	-	-	-	0
51	Behind	-	30	93.75	Near - (Near) two shapes Under - (Under) the top shape	1 1	3.125 3.125	-	-	0
52	Behind	- Sort of (behind) the other shape -(Behind) to the side - A bit (behind)	14	43.75	Next to -(Next to) towards the back - Almost (next to) Above	7 1	21.875 3.125	-	-	0
53	Behind	-	23	71.875	Behind, below and next to Under - (Under) two shapes	8 1	25 3.125	-	-	0
54	Behind	-(Behind) but a bit across -(Behind) to the top -Sort of (behind)	12	37.5	Above	10	31.25	-	-	0

55	In	- (In) the middle - Directly (in) the middle - (In) the centre	32	100	-	-	-	-	-	0
56	In front and behind	-	25	78.125	Behind and in front In front and above	5 2	15.625 6.25	-	-	0
57	In front	-	18	56.25	In front and between Below and between	8 2	25 6.25	Centre of the screen	4	0
58	In	- (In) the middle	22	868.75	Between - A bit (between) the other shapes	8	25	-	-	2
59	Next to	- (Next to) a bit apart - (Next to) but away – (Next to) but a bit far apart over to the side further away	29	90.625	-	-	-	To the side	3	0
60	Around	-(Around) halfway -(Around) some of the way	32	100	-	-	-	-	-	0
61	Behind	-(Behind) but at the end - Behind) to the side	29	90.625	Next to - (Next to) but towards the back	3	9.375	-	-	0
62	Between	-	17	53.125	In - (In) the middle of - (In) line with	14	43.75	Equal distance to the green and the blue	1	0
63	Behind	- Sort of (behind) the other shape - (Behind) to the side - A bit (behind) - Almost (next to)	17	53.125	Above	15	46.875	-	-	0
64	Behind	-	27	84.375	In - (In) line with Near	2 1	6.25 3.125	Centre	2	0
65	Next to	(Next to) but not touching	24	75	Beside	8	25	-	-	0

66	Under	(Under) holding up the shape	18	56.25	Underneath - (Underneath) the middle Beneath	10	31.25	- Supported centre - Balancing - Holding up the shape	1 1 2	0
67	In front	- (In front) to the side - (In front) away fro - (In front) at the corner of	23	71.875	Below - (Below) and over a bit Near - (Near) the edge	5 3	15.625 9.375	To the fore	1	0
68	In front	-	21	65.625	Above -(Above) the chair - (Above) the middle of the screen Behind On	5 3 3	15.625 9.375 9.375	-	-	0
69	Behind	- (Behind) the others	19	59.375	In - (In) the background - (In) the middle Between Above - (Above) halfway	5 3 1	15.625 9.375 3.125	- Away from - At the rear - Equal distance from	2 1 1	0
70	Next to	-	28	87.5	Beside	4	12.5	-	-	0
71	Over	-	21	65.625	Around - (Around) part of the way - (Around) some of the shape	9	28.125	Semi circle movement	1	1
72	Behind	-	12	37.5	In - (In) the middle of - Sits (in) the middle Between and next to	7 4	21.875 12.5	-Surrounded by - Crowded by - Encased	7 1 1	0
73	In front	- (In front) to the side - (In front) but over a bit	31	96.875	-	-	-	At the fore but to the side	1	0
74	Under	-	28	87.5	-	-	-	- Supporting the other shape - Holding up the other shape	3 1	0
75	Behind	-	24	25	In - (In) the middle Behind and next to	3 2	9.375 6.25	Surrounded by	4	0

76	In front	-	21	65.625	Between - (Between) but down a bit Near	6 4	18.75	To the fore	1	0
77	Between	-	31	96.875	-	-	-	Moves towards the middle of the two objects	1	0
78	-	-	-		-	-	-	-Surrounded - Circled - Middle of	30 1 1	0
79	Above	-	24	75	Behind	7	21.875	To the rear	1	0
80	On	- (On) the side	28	87.5	-	-	-	To the side	4	0
81	Across	-	30	93.75	On - (On) the other side	2	6.25	-	-	0
82	In	-	28	87.5	Inside	4	12.5	-	-	0

Appendix K

Adult understandings of the features related to the preposition 'next to'
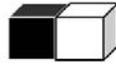
Image 1
- Next to
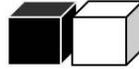
Image 29
- Next to
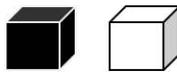
Image 32
- (Next to) but further away
- (Next to) but a bit apart
- (Next to) but a bit away

Image 37
- Next to
- Away from the other shape
- Towards the screen
- Four times the distance from other shape

Image 41
- On the screen
- On the other side of the screen
- Away from the other shape
- No response

Image 44
- (On) the screen
- Side of the screen
- Other side of the screen
- Towards the edge of the screen
- -Away from the other shape
- No response

The further away the two object become along a horizontal plane the less likely it is that adults will describe objects as 'next to'

Adult Instrument responses demonstrating vertical plane or projective plane preference when describing relationships between static objects

1. Behind (green shape) in front (of yellow) and 'next to (yellow shape)
2. 'Between' (and) 'next to'
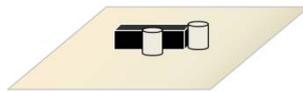
1. 'Behind' (red shape and) 'next to' (yellow shape)
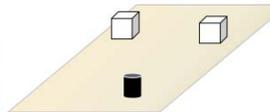
1. 'In front' (and) 'between'
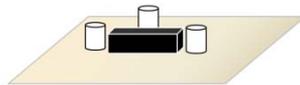
1. 'In front' (of the red shape) 'between' (the orange and blue)
2. 'In front' (of red) 'between' (Cylinders)
3. 'In front' (of red and) 'between'
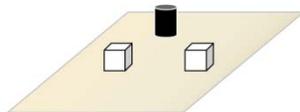
1. 'Above' (the others)
2. 'Above' (and) 'between'
3. 'Above'
4. (Rear and) 'between' (midway from both blue shapes)
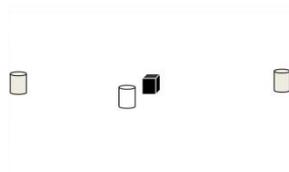
1. (Sort of) 'behind' (red shape and almost) 'next to' (the red shape)

Adult Instrument responses demonstrating ability to ignore objects in the vicinity if a prototypical configuration is available to describe
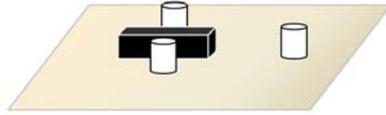
- • 'Between'

 - *Shape to the right ignored*
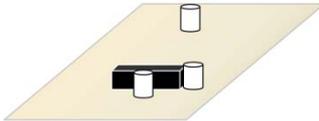
- • 'Behind' (green shape and) 'next to' (yellow shape)

 - *Shape behind/to the back ignored*

- • 'Between' (green and yellow shapes)
- • (In line with the green and yellow)

 - *Shape to the front left ignored*

- • 'Behind' (green shape)

 - *Shape to the left and right ignored*
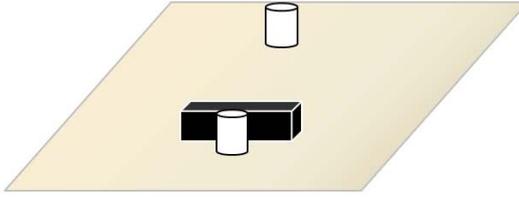
- 'Behind' (yellow shape)

- Shape to the back ignored
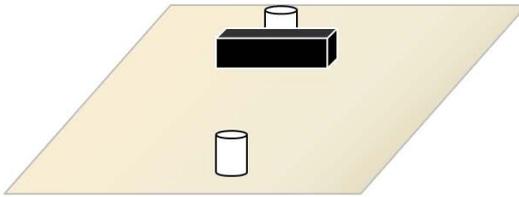
- 'In front' (of blue shape)

- Shape to the front ignored