UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

The iconicity of Picture Communication Symbols for children with English additional language and intellectual disabilities

by

Alice Huguet

Submitted in partial fulfilment of the requirements for the Masters degree in augmentative and alternative communication

Centre for Augmentative and Alternative Communication
Faculty of Humanities
University of Pretoria

Pretoria
July 2012

Acknowledgements

I would like to express my most sincere gratitude to the following people:

- My supervisor, Dr Shakila Dada, and my co-supervisor, Prof Juan Bornman for their invaluable, expert guidance and unfailing support and encouragement. I am so grateful that I had the opportunity to learn from your expertise.
- My husband, Guillaume Huguet, to whom this dissertation is dedicated. Thank you for your unwavering love and support which allowed me to do this work to the best of my ability.
- Jennifer Green, Martha Lydall, Nicola Hay, Bethany Fraser and Natalie Toy for their endless support, assistance and patience.
- Shannaz Adams and her department for their interest, participation and support.
- Susan Viljoen and her department for their generous help and patience.
- Chesca Malcom for her time, energy and assistance.
- The principals of the schools involved in this study for allowing me unpressured time and access.
- All the children who participated so enthusiastically, without whom this study would have been impossible.
- Michal Harty for her administrative support and assistance.
- Rina Owen for her help with the statistical analysis involved in this study and her input regarding the results.
- Elsa Coertze for her assistance in sourcing references.
- Herman Tesner for his speedy and expert language editing.
- Tamzin Hudson for her much appreciated help with a final and important step in this process!

Abstract

Augmentative and alternative communication (AAC) provides many individuals who have little or no functional speech with a means to enter the world of communication. Aided and/or unaided symbols are used as a means of reception and expression to create shared meaning. The selection of an appropriate symbol set/system is vital and iconicity plays a central role in this process. The Western-based symbol set, Picture Communication Symbols (PCS) (Johnson, 1981), is readily available and widely used in South Africa, despite little information existing on its iconicity to South African populations with disabilities.

This study aimed to determine the iconicity of Picture Communication Symbols (PCS) for children with English Additional Language (EAL) and intellectual disability. A quantitative, non-experimental, descriptive design was used. Thirty participants between the ages of 12;00 and 15;11 (years;months) with EAL and intellectual disability were required to identify 16 PCS presented thematically on a 'bed-making' communication overlay in response to a gloss read out by the researcher. The results indicated that, overall, the 16 PCS were relatively iconic to the participants. The results also indicated that the iconicity of PCS can be manipulated and enhanced and that it can be influenced by other PCS that are used simultaneously on the communication overlay. The reasons for these findings are described. The clinical and theoretical implications of this study's results are discussed, followed by a critical evaluation of this study and, finally, recommendations for future research are suggested.

Key terms

- Augmentative and alternative communication (AAC)
- Picture Communication Symbols (PCS)
- English Additional Language (EAL)
- Intellectual disability
- Iconicity

Opsomming

Aanvullende en alternatiewe kommunikasie (AAK) voorsien menige individu wat oor min of geen funksionele spraak beskik van ‘n middel om tot die wêreld van kommunikasie toe te tree. Gesteunde en/of ongesteunde simbole word reseptief en ekpressief gebruik om betekenis te skep en te deel. Die keuse van ‘n toepaslike simboolstelsel/sisteem is van kardinale belang en ikonisiteit speel ‘n sentrale rol in hierdie proses. Die Westersgebaseerde simboolstelsel “Picture Comunication Symbols (PCS)” (Johnson, 1981) is geredelik beskikbaar en word vryelik in Suid-Afrika gebruik, ten spyte van min inligting oor die ikonisiteit daarvan vir Suid-Afrikaanse bevolkingsgroepe met gestremdhede.

Die doel van hierdie studie was om die ikonisiteit van PCS vir kinders met Engels Addisionele Taal (EAT) en intellektuele gestremdheid te bepaal. ‘n Kwantitatiewe, nie-eksperimentele, beskrywende navorsingsontwerp is gevolg. Dertig deelnemers tussen die ouderdomme van 12;00 en 15;11 (jaar;maande) met intellektuele gestremdheid is gevra om 16 PCS te identifiseer, almal in die konteks van ‘n ‘bed-opmaak’ kommunikasietemplaat in respons op die simbool-opskrif wat deur die navorser voorgelees is. Die resultate het aangedui dat die 16 simbole oor die algemeen relatief ikonies vir die deelnemers was. Verder het die resultate getoon dat die ikonisiteit van die simbole manipuleerbaar is en verryk kan word; die ikonisiteit van ‘n simbool kan ook beïnvloed word deur ander simbole wat terselfdertyd op die kommunikasietemplaat gebruik word. Die redes vir hierdie bevindings word beskryf. Die kliniese en teoretiese implikasies van die resultate van hierdie studie word bespreek, gevolg deur ‘n kritiese evaluering en aanbevelings vir verdere navorsing.

Sleutelwoorde

- Aanvullende en alternatiewe kommunikasie (AAK)
- Picture Comunication Symbols (PCS)
- Engels Addisionele Taal (EAT)
- Intellektuele gestremdheid
- Ikonisiteit

Table of Contents

List of Tables

List of Figures

List of Appendices

Chapter 1
Introduction

1.1 Introduction

This chapter provides an orientation to this study. The problem statement is discussed, outlining the rationale for the study. A chapter outline is provided, as well as a discussion of the terminology and abbreviations used in this study.

1.2 Problem statement

Typical communication involves the representation of meaning usually by spoken or printed words (Lloyd, Fuller, Loncke, & Bos, 1997). However, many individuals with intellectual disabilities have little or no functional speech (LNFS) and cannot access the use of these conventional communication methods (Mineo Mollica, 2003). The field of augmentative and alternative communication (AAC) provides these individuals with methods to create shared meaning by using aided and/or unaided symbols (Stephenson, 2009a). There is a broad range of unaided and aided methods used in AAC; however, graphic symbols form a very important component of most AAC systems (Basson & Alant, 2005; Fuller & Lloyd, 1997; Fuller, Lloyd, & Stratton, 1997; Lloyd et al., 1997). Choosing an appropriate graphic symbol set/system is one of the most important considerations when implementing AAC for individuals with LNFS (Stephenson, 2009a).

When deciding on a particular symbol set/system for a potential AAC user, one of the symbol selection considerations is iconicity (Fuller & Lloyd, 1997). Iconicity refers to the degree to which a symbol represents its referent through visual similarity (Fuller & Lloyd, 1997). Fristoe and Lloyd (1979) first described the iconicity hypothesis suggesting that iconicity enhances the learning and retention of symbols for communication development in individuals with LNFS. Several studies have supported this hypothesis (Bloomberg, Karlan, & Lloyd, 1990; Mirenda & Locke, 1989; Mizuko, 1987), as did Lloyd and Fuller (1990) who indicated that iconicity facilitates the learning of communication symbols for individuals with normal cognition, as well as for those with mild to moderate intellectual disabilities. Therefore, iconicity information will play an important role in selecting an appropriate choice of a particular symbol set/system in the design of an effective AAC solution for an individual.

For the past three decades the importance of iconicity has been emphasised particularly when choosing graphic symbols for an AAC user who will be communicating with partners who are non-readers (Mizuko, 1987; Musselwhite & Ruscello, 1984). Therefore, considering the iconicity of graphic symbols is imperative in a country such as South Africa with its high levels of illiteracy (Basson & Alant, 2005). Literate communication partners of individuals using graphic symbols can read the gloss that accompanies the symbol (Basson & Alant, 2005). However, illiterate communication partners will have to rely on the iconicity of the symbol to determine its meaning (Basson & Alant, 2005).

Most iconicity studies have been conducted in a European-American linguistic community, despite growing awareness of the influence of language and culture (Huer, 2000). Beukelman and Mirenda (2005) indicate that cultural background influences iconicity and symbol learning. The perception of graphic symbols is influenced by the language and life experiences of individuals (Huer, 2000). Many children with disabilities in South Africa have diverse cultural and linguistic backgrounds, and multilingualism has increased in urban areas (De Klerk, 2002). These children, especially those in Gauteng, often learn English when entering the formal schooling system as it is generally the language of learning and teaching (LoLT) (Meirim, Jordaan, Kallenbach, & Rijhumal, 2010). Therefore, English is often not the home language but becomes an additional one in which teaching, therapy intervention and AAC is provided (Meirim et al., 2010).

Picture Communication Symbols (PCS) (Johnson, 1981) is an aided, static communication symbol set that currently includes over 9000 symbols (Emms & Gardner, 2010). It is readily available and widely used in South Africa (Bornman, Bryen, Kershaw, & Ledwaba, 2011; Visser, Alant, & Harty, 2008), largely due to its availability and its applicability to inexpensive, low technology AAC systems. Therefore, information concerning its iconicity within the South African context is valuable. A number of international studies have found it to be relatively iconic compared to other graphic symbol sets/systems (Bloomberg et al., 1990; Huer, 2000; Mirenda & Locke, 1989; Mizuko, 1987). In South Africa, Haupt and Alant (2002) investigated the iconicity of PCS for 10-year-old, isiZulu-speaking children, and Basson and Alant (2005) conducted a similar study with 6-year-old, Afrikaans-speaking children. Both studies reported relatively low iconicity levels for the specific symbols used in

the research, indicating that PCS may not be readily transparent to these South African populations (Basson & Alant, 2005; Haupt & Alant, 2002).

The children in the two aforementioned South African studies were typically developing, as is the case in many other iconicity studies. Information about the iconicity of aided symbols for disabled populations is less available. Mirenda and Locke (1989) emphasised the need for further research identifying symbol sets/systems that are highly iconic for learners with disabilities, to reduce the learning time it may take to teach the symbol set/system. Therefore, information regarding the iconicity of symbol sets/systems for individuals with intellectual disabilities is important.

One of the most essential goals in AAC clinical practice is to provide a meaningful symbol set/system for the AAC user; iconicity plays a central role in the selection process of the appropriate set/system (Huer, 2000). This study, investigating the ways in which children with EAL and intellectual disabilities relate to PCS, could provide valuable information regarding the use of PCS with children following atypical development within a South African context.

1.3 Chapter outline

Chapter 1 provides a brief overview of and an introduction to the study, as well as an outline of each chapter. Important terminology and abbreviations are explained.

Chapter 2 gives a detailed discussion of the theoretical background to the study. The various influences on the iconicity of graphic symbols are described, with particular reference to individuals with intellectual disabilities. The literature is reviewed with a focus on three South African research studies discussing the iconicity of PCS in detail, as well as on seven international iconicity studies involving individuals with intellectual disability.

Chapter 3 presents a detailed description of the methodology for this study. The aims of the study and the research design and phases are outlined. The results of the pilot study are presented in table format, as well as recommendations for the main study. Next, the main study is discussed in terms of participant selection criteria, ethical considerations, data

collection procedures, followed by a discussion of equipment and materials. Finally, data analysis, reliability and validity issues are described.

Chapter 4 presents and discusses the results. The results are presented graphically in tables and histograms in accordance with the aims proposed in the methodology. The frequency selections of the target and non-target PCS are analysed and discussed.

Chapter 5 provides a summary of the clinical and theoretical implications of this study's results. A critical overview of the study, highlighting its strengths and limitations, is also presented. Recommendations for further research are made.

1.4 Terminology

Augmentative and alternative communication (AAC)

In this study augmentative and alternative communication (AAC) refers to the following generally accepted definition: 'The supplementation or replacement of natural speech and/or writing using aided and/or unaided symbols; the field or area of clinical/educational practice to improve the communication skills of individuals with little or no functional speech' (Lloyd, Fuller, & Arvidson, 1997, p. 524).

Communication overlay

This term refers to letters, words, pictures or other graphic symbols pertaining to a predetermined category, topic or theme and arranged on paper or some other material to assist communication (Quist & Lloyd, 1997). This study used a 16 PCS communication overlay designed around a 'bed-making' theme. The symbols were randomly arranged on an A4 page in four rows of four.

Culture

In this study culture refers to, 'a set of behaviours, institutions, beliefs, technologies, and values invented and passed on by a group of individuals to sustain what they believe to be a high quality of life and to negotiate their environments' (Taylor & Clarke, 1994, p. 103).

English additional language (EAL)

The phrase *English additional language* is used in educational settings to describe the language status of multilingual learners in relation to the language of learning and teaching (LoLT), which is often English (Naudé, 2005).

Distinctiveness

This term was coined by Haupt and Alant (2002, p. 44) to describe, "how well defined or specific were the evoked meanings triggered by a symbol in the mind of the viewer." It relates to whether viewers perceive similarity to one referent, to many or to none (Haupt & Alant, 2002). In this study distinctiveness relates to how often a PCS was selected as a non-target PCS. A PCS is described as distinctive if it was selected relatively rarely as a non-target PCS when compared to the other PCS used in this study. Conversely a PCS is described as indistinctive if it was selected relatively often as a non-target PCS.

Graphic symbols

These are visual symbols (e.g. Lexigrams, Blissymbols) that can be displayed on paper or other materials or on computer screens, communication devices or other electronic devices. In this study the symbol set that was used was Picture Communication Symbols (PCS). PCS is a large, aided, graphic communication symbol set comprised mainly of simple line drawings with words printed above them (Lloyd et al., 1997).

Iconicity

This study uses a psycholinguistic understanding of the term *iconicity* in that it refers to any type of association that a viewer forms to link a symbol to its referent, not only a visual one (Schlosser & Sigafoos, 2002). Iconicity exists on a continuum with transparency at one end and opaqueness at the other (Lloyd & Fuller, 1990). A symbol is considered transparent when its visual aspects are highly suggestive of its referent, and therefore the meaning can be easily determined by naïve viewers, without the provision of additional cues (Blischak, Lloyd, & Fuller, 1997). A symbol is seen to be translucent when the relationship between a symbol and its referent is not readily guessable, but can be perceived by naïve viewers once the referent is known (Blischak et al., 1997). The relationship is semantic, conceptual or linguistic, thus making translucency a less restrictive aspect of iconicity than transparency (Bloomberg et al., 1990). When a symbol is not considered iconic it is often referred to as opaque (Blischak et al., 1997).

Intellectual disability

The American Association on Mental Retardation defines intellectual disability as being characterised by, "significant limitations in both intellectual functioning and adaptive behaviour as expressed in conceptual, social and practical adaptive skills. This disability originates before age 18" (Luckasson et al., 2002, p.1). For the purposes of this study participants presented with an intelligence quotient (IQ) score of between 50 and 70 obtained from the administration of the Kaufman Brief Intelligence Test - Second Edition (KBIT-2) (Kaufman & Kaufman, 2004). This score is indicative of a mild intellectual disability (Kaplan & Sadock, 1998).

Little or no functional speech (LNFS)

This refers to individuals who are unable to produce intelligible speech or who are only able to produce 15 or less intelligible words (Cantwell & Baker, 1985).

Non-target PCS

The PCS that participants selected in response to a spoken gloss not intended for that PCS, are referred to as non-target PCS. The non-target PCS were unexpected symbol selections made by the participants in response to a particular gloss.

PCS manipulation

This refers to the changes or manipulations that can be made to PCS to enhance their iconicity for a specific AAC user and communication overlay/context.

PCS modification

This is one type of PCS manipulation in which one or more aspects of the PCS are altered without changing the overall appearance of the resulting PCS.

PCS replacement

This refers to another type of PCS manipulation in which a PCS may be replaced with a different one to represent the same gloss or meaning.

PCS removal

This is a third type of PCS manipulation in which a PCS and its gloss are removed entirely from a communication overlay and exchanged for a different PCS, gloss and meaning. This

manipulation would only be made if PCS modification or replacement were not possible, and if the original symbol was interfering with effective communication.

Perceptually indistinctive

In this study a PCS is described as perceptually indistinctive when it shares visual components with a different PCS used in this study that make them look similar.

Semantically indistinctive

In this study a PCS is described as semantically indistinctive when it can represent the same gloss/meaning as that of a different PCS used in this study, although they do not look similar visually.

Target PCS

The PCS that the participants selected in response to a spoken gloss intended for that PCS, are referred to as target PCS. In other words, the target PCS are the ones the participants were expected to select in response to a particular gloss.

1.5 Abbreviations

AAC	Augmentative and alternative communication
CP	Cerebral palsy
EAL	English additional language
EOWPVT	Expressive One-Word Picture Vocabulary Test
ID	Intellectual disability
IQ	Intelligence quotient
KBIT-2	Kaufman Brief Intelligence Test – Second edition
LoLT	Language of learning and teaching
LNFS	Little or no functional speech
LSEN	Learners with special educational needs
PCS	Picture Communication Symbol/s
ROWPVT	Receptive One-Word Picture Vocabulary Test

1.6 Summary

This chapter provides an orientation and background to this study. In addition, it provides the rationale for the study by highlighting the need for iconicity studies on non-Western populations and participants with disabilities. Each chapter is outlined and frequently used terminology and abbreviations are described.

Chapter 2
Literature Review

2.1 Introduction

This chapter provides the theoretical background for this study. The framework for this chapter is based on the various influences on the iconicity of graphic symbols. Four groups of effects, namely symbol, referent, instructional and individual effects are discussed in detail and with particular reference to individuals with intellectual disabilities. Three South African studies discussing the iconicity of PCS are considered in detail, as well as seven international iconicity studies involving individuals with intellectual disability.

2.2 Influences on the iconicity of graphic symbols

Iconicity has been widely discussed in AAC literature and research, and various definitions have been proposed. However, it has been less discussed within the context of intellectual disability and hence its application in relation to this population has been less explored. Common definitions describe iconicity as a perceived relationship between a symbol and its referent, which is often defined as a visual similarity (Blischak et al., 1997; Fristoe & Lloyd, 1979; Lloyd & Fuller, 1990; Mizuko, 1987; Schlosser & Sigafoos, 2002). However, from a psycholinguistic perspective, iconicity can refer to any type of association that a viewer forms to link a symbol to its referent (Schlosser & Sigafoos, 2002) as discussed in the previous chapter.

The concept of iconicity falls along a continuum ranging from transparent to translucent to opaque, depending on the ease with which naïve viewers can guess the symbols' meaning (Fuller & Lloyd, 1997). Transparent symbols are highly suggestive of their referents and their meanings can be easily determined by naïve viewers, without the provision of additional cues (Blischak et al., 1997). Translucent symbols are not readily guessable, but a relationship between the symbol and its referent can be perceived by naïve viewers once the referent is known (Blischak et al., 1997). Overlap exists between transparency and high translucency because symbols that are easily identified naturally have a great degree of relationship to the referent (Lloyd & Fuller, 1990). Opaque symbols are abstract in that they have very little or

no visual relationship to their referents (Blischak et al., 1997). They are not guessable, and must therefore be taught (Bloomberg et al., 1990).

The iconicity of graphic symbols is influenced by many variables for a given viewer, with or without intellectual disability. These variables can be divided into four groups: symbol effects, referent effects, instructional effects and individual effects. Figure 2.1 provides a visual representation of the various effects on the iconicity of graphic symbols.

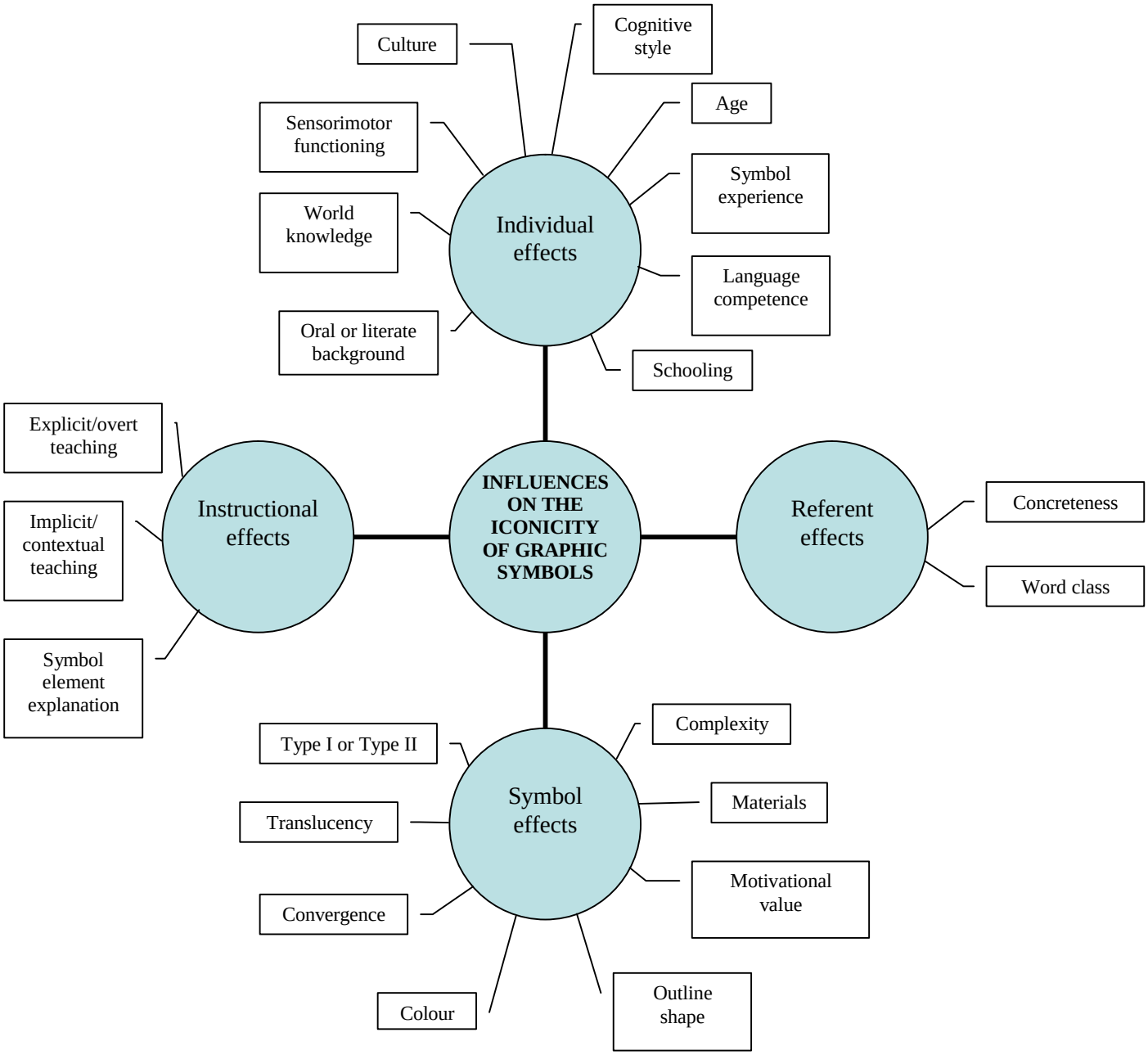

Figure 2.1. Influences on the iconicity of graphic symbols. This figure illustrates the various

influences on the iconicity of graphic symbols. Each will be discussed in detail, starting with symbols effects.

2.3 Symbol effects

There are numerous symbol effects that may influence the iconicity of graphic symbols. The first to be discussed is the material on which the symbol is printed (Deregowski, 1980). An Ethiopian population, unfamiliar with paper, was seen to handle pictures on paper as objects, although they were able to recognise pictures depicted on familiar materials (Deregowski, 1980). A study conducted with Northern Nigerian boys showed that they were unable to recognise familiar figures on paper, but were able to identify the same figures depicted in carvings or on native leatherwork (Nadal, 1939). For the iconicity of graphic symbols to aid in their interpretation, the symbols should be printed on a material familiar to the viewer.

Outline shape is another symbol variable that may affect iconicity. Dixon (1981) conducted a study of the object-photo matching skills of severely intellectually disabled adolescents. Results indicated that matching abilities improved when the photos were cut out according to the actual shape of the depicted object, indicating that outline shape improved the iconicity of the photos (Dixon, 1981). Stephenson (2009b) also investigated the effects of outline shape on iconicity in severely intellectually impaired children, using objects and line drawings (Stephenson, 2009b). Her results indicated that varying the outline shape correspondences of the line drawings did not affect iconicity, and that there was no advantage for line drawings that matched the outline shape of the depicted objects (Stephenson, 2009b). At this stage it remains unclear as to whether outline shape affects iconicity; further research into this area is needed.

Colour has become an increasingly flexible variable in pictures and line drawings since the advent of computer software that allows easy colour manipulation (Stephenson, 2007). Visual cognitive science research has shown that colour may play an important role in the perception, learning and recall of graphic AAC symbols (Wilkinson & Jagaroo, 2004). However, there appears to be a paucity of research in this aspect of AAC and the few studies that have been conducted have only investigated the effects of colour on basic skills (Thislte & Wilkinson, 2009).

Wilkinson, Carlin, and Jagaroo (2006) conducted a study into the role of colour on the accuracy and speed of symbol location for typically developing pre-school children using six display panels depicting eight symbols at a time (either PCS of fruit or different shapes). The participants were shown a symbol and were required to identify the matching one from each panel. The results indicated that accuracy was higher and reaction times faster when the eight symbols were all depicted in unique colours as opposed to the same colour, or only two different colours. Alant, Kolatsis, and Lilienfeld (2010) conducted a similar study, but with a focus on the impact of the sequential exposure of three colour conditions on the accuracy and rate of symbol location. Their results indicated that the order in which the arrays with the different colour conditions were presented influenced both the accuracy and time of symbol location. Thislte and Wilkinson (2009) investigated the effects of foreground and background colour manipulation on the rate of location of target line drawings for typically developing pre-schoolers. They used four display panels, each with 12 PCS of fruit and vegetables, with varying foreground and background colour manipulations from which the participants were required to identify the correct symbol in response to an auditory stimulus. Their results provided clear statistical support for the use of foreground colour as a facilitating factor in locating a target line drawing. Although these studies do not directly investigate the effects of colour on iconicity, they prove that colour cues can influence basic search tasks (Thistle & Wilkinson, 2009) suggesting that colour may have a role to play in the iconicity of graphic symbols.

A few studies exploring the influence of colour on symbol location and iconicity have been conducted with participants with intellectual disabilities. Wilkinson, Carlin, and Thistle (2008) conducted a study on the effects of foreground colour distribution on the speed and accuracy of symbol location for children with and without Down syndrome. They used six display panels each with 12 PCS (two panels depicting food, two depicting clothes and two depicting activities). The participants were required to identify the matching symbol from an auditory stimulus for the food panels and an identical visual stimulus for the clothes and activities panels. The results indicated that grouping same-coloured line drawing symbols together on an array improved location times for all the participants and enhanced search accuracy for the younger ones (3 years of age) and those with Down syndrome. Stephenson (2007) investigated the effect of colour on line drawing recognition and use in young children with severe intellectual disability and poor verbal comprehension who were beginner picture-users. The results indicated that for some children colour match between symbol and referent

did enhance iconicity (Stephenson, 2007). However, a similar study by Stephenson (2009b) involving children with severe intellectual disability, but of varying age and picture skills, contradicted these findings; these results indicated that colour match had no significant impact on line drawing recognition and use (Stephenson, 2009b). As with the outline shape of graphic symbols, research on the influence of colour on iconicity has provided conflicting results which could only be clarified through further investigation.

The motivational value of a graphic symbol may also influence its iconicity and colour is likely to enhance this motivational value for children using AAC systems. A study conducted by Light, Drager, and Nemser (2004) emphasises the importance of colour as a motivational factor in AAC systems. They compared and contrasted the design features of five award winning toys for young children with those of voice activated output communication aids typically recommended for young children (Light et al., 2004). Regarding colour, the results indicated that AAC devices should incorporate numerous bright, glossy colours in order to appeal to their potential users and create motivation for consistent use (Light et al., 2004). Another study affirming the use of colour with AAC was conducted by Light, Page, Currin, and Pitkin (2007). They used a participatory research design to investigate the preferences and priorities of children for AAC technologies (Light et al., 2007). Six typically developing children between the ages of 7 and 10 years were asked to design an 'invention' to help children with LNFS communicate (Light et al., 2007). The results of the study showed, in regard to colour, that the participants preferred the use of multiple, bright colours to decorate their AAC device 'inventions' and to enhance the graphic vocabulary symbols, (Light et al., 2007). The results of these studies indicate that colour is likely to enhance the motivational value of graphic symbols for children, thereby increasing their iconicity. PCS are advantageous in this respect as their colours can be easily changed at will (Wilkinson et al., 2008).

Another motivational aspect of graphic symbols is the level of value they have for the user. It can be argued that an opaque symbol may be more easily learned and interpreted than an iconic one if it is of high interest and value to the individual using it (Mineo Mollica, 2003). For example, a child may learn an abstract symbol for chocolate more easily than an iconic one for vegetables. Not only symbols for objects, such as treats and toys, may have high motivational value (Mineo Mollica, 2003). Language items such as 'More,' and, 'Look at

this!' are often of high value to individuals using AAC, because they empower the user by allowing him/her to control the environment (Wilkinson, Romski, & Sevcik, 1994).

Translucency is another symbol variable that may influence the iconicity a graphic symbol. Huang and Chen (2011) conducted a study exploring the effect of translucency on transparency and symbol learning. They used 10 highly translucent symbols and 10 symbols with low translucency from the Unlimiter Line Drawing Color set with 20 children with cerebral palsy and 40 of their typically developing peers (Huang & Chen, 2011). All the participants were reported to have intact intellectual functioning and were attending a mainstream elementary school in Taiwan (Huang & Chen, 2011). The results of the study showed a positive relationship between translucency and transparency in that the highly translucent symbols were more iconic than the symbols with low translucency (Huang & Chen, 2011). In addition, the highly translucent symbols were learned faster and more easily, supporting the 'iconicity hypothesis' (Huang & Chen, 2011).

Symbol complexity can also influence iconicity. The complexity of a graphic symbol is dependent on the amount of information contained in the symbol (Fuller et al., 1997). It can be predicted by the number of physical strokes (visual complexity) or semantic elements (component complexity) necessary to depict the symbol (Fuller & Lloyd, 1987). It can be argued that higher visual complexity may increase iconicity and that low visual complexity in symbols may reduce it, because there may not be enough visual clues for the meaning to be derived from the symbol alone (Koekemoer, 2000). PCS generally have high visual complexity. Component complexity may have an inverted relationship with iconicity (Luftig & Bersani, 1985). The greater the component complexity, the more information there is to process, putting higher demands on the cognitive processing of the symbol and reducing its iconicity (Luftig & Bersani, 1985). However, as the symbols become more familiar (over time) the effects of component complexity may lessen (Luftig & Bersani, 1985). The more semantic elements present in a symbol, the more visual cues there are to rely on for interpretation, thereby increasing the iconicity of the symbol (Luftig & Bersani, 1985). PCS generally have low component complexity.

Convergence within symbol sets and systems may be another variable that could affect iconicity. Convergence can be defined as 'systematic relationships of category levels with respective nomenclatures' (Schlosser, 1997, p. 5). Convergence in spoken language is

relatively high, albeit imperfect, in that the morphological structure and/or word class of the vocabulary remains relatively consistent for words at the same categorical level (Schlosser, 1997). For example, basic-level categories tend to be primary lexeme nouns such as 'car' whereas words at the subordinate level are typically labelled with secondary lexemes such as 'sports car' or 'four-door sedan' (Schlosser, 1997). Regarding graphic symbols, convergence refers to the consistency of the visual structure of the symbol within the same categorical level, for example, basic-level categories in Blissymbols are generally depicted by single semantic elements or pictographs (Schlosser, 1997). It is hypothesised that symbol systems, as opposed to symbol sets, demonstrate convergence in graphic symbols used for communication (Schlosser, 1997). PCS is a symbol set and shows low convergence (Schlosser, 1997). A higher level of convergence may increase iconicity since it may enhance the predictability of the meaning of the symbol. For example, a pictographic Bliss symbol could indicate that it represents a noun (e.g. table), as opposed to a compound noun (e.g. furniture), which would generally be depicted by a Bliss symbol with more complex morphology (Schlosser, 1997).

Varying features of graphic symbols will be processed differently and therefore influence iconicity (McNaughton & Lindsay, 1995). McNaughton (1993) differentiates between two basic types of graphic symbol structure – Type One symbols and Type Two symbols. The pertinent differences between the two relate to what they symbolise, how they symbolise it and the way complex symbols are constructed from primary elements (McNaughton & Lindsay, 1995). In Type One symbols iconicity plays a role in their representation in that the symbol's elements depict the referent's salient visual features (McNaughton, 1993). These symbols are processed as a whole/*gestalt* or as arrays of patterns, relatively directly and without linguistic coding (McNaughton, 1993). PCS fall into this category.

In Type Two symbols visual appearance does not play a role in symbol-referent relationships and therefore there is no dependence on visual matching (McNaughton, 1993). The association between referent and symbol is made through other domains, such as the phonologic and semantic (McNaughton, 1993). Iconicity does not come into play in the processing of these symbols. Type Two symbols that relate to the referent phonologically rely on letter-sound relationships, such as in English orthography, whereas the semantic domain is represented through meaning (McNaughton, 1993). Type Two symbols involve the sequencing of their components within symbols and between symbols by following

established rules or logic, just as oral language and traditional orthography do (McNaughton & Lindsay, 1995). This implies that some linguistic coding may take place in the processing of Type Two symbols. Some symbols can be seen to represent elements of both Type One and Type Two symbols, thus making them mixed symbols (McNaughton, 1993). In these cases processing aspects for both symbol types may occur.

This study investigated the iconicity of PCS for children with EAL and intellectual disability. To summarise, all the PCS used in this study were black and white; colour was not an influencing factor. Neither was the material on which the PCS were printed, which was paper, since all the participants were familiar and experienced with paper as a printing material. PCS are mostly examples of Type One symbols, and therefore it is likely that iconicity will play a role in their processing. PCS show low convergence (Schlosser, 1997), which may negatively influence their iconicity. Regarding symbol complexity, they generally have high visual complexity and low component complexity which may increase their iconicity. They tend to have many visual cues to aid interpretation and few components to increase the demands on their cognitive processing.

Several other symbol variables could influence iconicity such as contrast, size and canonical perspective (Beukelman & Mirenda, 2005). However, little research into the impact of these variables on iconicity has been conducted (Stephenson, 2009b).

2.4 Referent effects

The second group of variables that influence the iconicity of graphic symbols is referent effects. The concreteness or, in other words, the ease with which a referent suggests an image of its symbol, is likely to affect the iconicity of that symbol (Yovetich & Young, 1988). Iconicity is especially relevant for pictures representing concrete referents such as objects (nouns), since they lend themselves more directly to graphic representation (Schlosser & Sigafoos, 2002; Yovetich & Young, 1988). Therefore, concreteness is often affected by word class. Mizuko (1987) conducted a transparency and ease of learning study on Blissymbols, PCS and Picsyms for typically developing pre-school children. The results indicated that the Picsyms and PCS that were used in his study were equal in iconicity for nouns, while verbs and adjectives were more transparent in PCS (Mizuko, 1987).

Bloomberg et al. (1990) conducted a comparative translucency study between five symbols sets and systems using adult undergraduate students. The study used symbols from three word classes, namely nouns, verbs and modifiers (Bloomberg et al., 1990). The results indicated that nouns were consistently the most translucent class across the five symbols sets and systems (Bloomberg et al., 1990); in three of the five sets (Rebus, PCS and PIC) verbs were more translucent than modifiers (Bloomberg et al., 1990). Nouns are a highly concrete word class because many of the distinctive features of their referents that permit recognition are preserved in graphic form (Bloomberg et al., 1990). Results from Haupt and Alant's (2002) iconicity study of PCS for 10-year-old, typically developing isiZulu children also indicated nouns as more iconic than the other word classes represented in their study.

Studies with intellectually disabled participants have also yielded results indicating that nouns are more iconic than other word classes. Mizuko and Reichle (1989) conducted a comparative transparency and recall study between Blissymbols, PCS and Picsyms using three grammatical classes, namely nouns, verbs and descriptors with speaking intellectually disabled adults. The results indicated that, overall, Picsyms and PCS were more transparent and easier to recall than Blissymbols (Mizuko & Reichle, 1989). Nouns were more easily identified and recalled, with absence of a significant difference between the symbols systems for verbs and descriptors, indicating that iconicity is more relevant to concrete words (Mizuko & Reichle, 1989).

The PCS symbols used in this study comprised mostly of verbs and descriptors, which are less concrete than nouns. Their reduced concreteness could have influenced the results by lowering their levels of iconicity.

2.5 Instructional effects

The third group of variables that influences iconicity is instructional effects. There are few empirical studies that have specifically investigated the effects of different types of instruction on the understanding and use of graphic symbols (McNaughton & Lindsay, 1995). Those that have been conducted generally involved symbol systems such as Blissymbols, possibly because one can compare more implicit teaching methods with more overt teaching of the logic within the system and symbol element expansion.

Schlosser and Lloyd (1993) investigated the effects of explicit instruction on Bliss symbol acquisition for typically developing preschoolers. They taught the elements of compound Bliss symbols first in a storytelling context, before teaching the compound symbols. Their results indicated that the later learning of new compound symbols was positively affected by initially teaching the elements themselves and then teaching the compound symbols formed with those elements, rather than by teaching the elements within the context of the compound symbol learning (Schlosser & Lloyd, 1993).

Moolman and Alant (1997) compared the results of two training approaches in the teaching of seven single configuration and eight compound Bliss symbols to six intellectually disabled children ranging in age from 7 – 10 years. One group of participants was exposed to a global training approach and another group to an analytic approach (Moolman & Alant, 1997). Both approaches used three steps during the training: identification, association and labelling (Moolman & Alant, 1997). However, during the identification step in the analytic approach, the different symbols elements were analysed, discussed individually and then synthesised again (Moolman & Alant, 1997). Participants of this group were guided in their analysis and synthesis of the symbols and the rationale behind each one was explained (Moolman & Alant, 1997).

The results of the Moolman and Alant (1997) study indicated that the analytic training approach was much more time-consuming than the global approach. However, the ease of acquisition of the Blissymbols was similar for both groups and no statistically significant difference between the groups' performances was found (Moolman & Alant, 1997). Despite this finding, there was a definite tendency for participants who had received the analytic training approach to perform better on the re-evaluation and generalization procedures (Moolman & Alant, 1997). It was concluded that both training approaches were successful in teaching the participants Bliss symbols, although the analytic approach may have more long-term benefits (Moolman & Alant, 1997).

A study conducted by Emms and Gardner (2010) focussed on the teaching of a symbol set, as opposed to a symbol system. Their study compared two contrasting teaching methods of PCS namely, a direct symbol-teaching method and a contextual symbol-teaching method. It also investigated the relationship between iconicity and teaching method. A total of 72 PCS (36 transparent and 36 translucent/opaque) were used with 14 participants with physical and other

learning disabilities. The participants were selected from two school classes and therefore formed two age groups – Class 1 with a mean age of 09;02 (years;months) and Class 2 with a mean age of 15;08 (years;months). A crossover design was used allowing for the two forms of intervention to be compared with the two age groups of participants. The direct-teaching method involved explicit discussion of each PCS in terms of colour, shape, form, meaning and use, whereas the contextual-teaching method used a story in which the PCS featured and the participants were simply exposed to them. Overall, the results indicated better recall for PCS symbols taught through the direct-teaching method. However, the older group of participants benefitted equally from both teaching methods, with a slight preference for the contextual-teaching method. These findings suggest that the younger children were not able to extract the information they needed from the contextual-teaching method and required more information and discussion of the PCS. These results also emphasise the phenomenon that learning style may change with maturation and that educators and clinicians need to adapt to the changing needs of learners. Concerning iconicity, the results showed that translucent/opaque PCS were better taught through the direct-teaching method, whereas for transparent symbols the teaching method was not that critical, suggesting that translucent/opaque symbols cannot be acquired through exposure only and should be taught more explicitly. Conversely, transparent PCS could be used widely in the school environment and during curriculum lessons to support their acquisition.

In summary, the studies referred to above indicate the varying effects different types of instruction may have on the acquisition of graphic symbols, as well as the positive effects of more explicit teaching, especially for translucent/opaque symbols. A more explicit teaching approach may enhance the understanding of these graphic symbols, thereby increasing their iconicity to improve learning and retention. Von Tetzchner and Grove (2003, p. 24) argue that, 'explicit teaching may be critical to children's acquisition of alternative means of communication.' DeLoache, Peralta de Mendoza and Anderson (1999) caution that adults tend to underestimate the amount of explicit teaching needed to acquire symbolic knowledge and skills.

2.6 Individual effects

The last group of variables that influence the iconicity of graphic symbols, and perhaps the most pertinent to this study, is individual effects. The first of these variables discussed below

is age. With age comes the experience and knowledge that will allow an individual to make the appropriate associations between a symbol and its referent. One cannot assume that a symbol, which may seem highly iconic to an adult, will be the same for a child. Findings from a study conducted by Emms and Gardner (2010) discussed in Section 2.5, indicated that younger children, with a mean age of 09;02 (years;months), required more explanation and discussion of PCS for the symbols to be understood and recalled. These children did not make the associations between the symbols and their referents as naturally as the older children, with a mean age of 15;08 (years;months), did (Emms & Gardner, 2010). Age will affect the iconicity of graphic symbols for a given viewer, because there is a relationship between world knowledge and age.

Different cognitive or thinking styles are also likely to play a role in the iconicity of graphic symbols. Cognitive style can be defined as the way in which experiences are perceived, organised, processed and conveyed behaviourally (Taylor & Clarke, 1994). Different cultures display different cognitive styles, which may affect the way in which people from different cultures perceive and process graphic symbols (Taylor & Clarke, 1994).

Witkin (1967) describes two different thinking styles – field-dependence and field independence. While all individuals show degrees of both cognitive styles, field-independent thinkers tend towards a more analytical perspective of the world, preferring attention to detail and being more object-orientated (Witkin, 1967). Field-dependent thinkers tend to view the world and experiences as part of a relationship and they depend on context for meaning (Witkin, 1967). Therefore, these two cognitive styles may result in different approaches to searching for meaning in graphics – the first looking more closely at the details and individual components of the graphic symbol, whereas the latter would find meaning in looking at the whole graphic and the context that accompanies it. The South African participants in this study are likely to be field-dependent thinkers when it comes to interpreting symbols, due to reduced literacy levels and a predominantly oral language background (Bornman, Alant, & Du Preez, 2009). According to Bornman et al. (2009) Setswana children may interpret symbols more holistically as opposed to a more analytical approach seen in children with higher literacy levels and a print enriched background.

Yet another individual variable influencing the iconicity of graphic symbols is whether an individual has an oral or literate background. Children who grow up in a literacy-rich

environment will have exposure to and direct experience with a variety of graphic symbols through reading and writing materials, storybook reading and observing and interacting with experienced graphic symbol users (Pierce & McWilliam, 1993). Through handling books, drawing pictures and scribbling children begin to learn the representational nature of graphic symbols (Pierce & McWilliam, 1993).

Schooling is also likely to influence the iconicity of graphic symbols. Martlew and Connolly (1996) conducted a study into the ability to draw human figures by schooled and unschooled children in Papua New Guinea. The effects of schooling were found to be significant, even if the schooling exposure was brief and indirect. All the children attending school drew conventional, representational human figures (Martlew & Connolly, 1996). In addition, the drawings of the unschooled children living in an area with a school were superior to those of unschooled children living in an area without a school (Martlew & Connolly, 1996). These children produced nonrepresentational scribbles and shapes (Martlew & Connolly, 1996). The results indicate that schooling initiates representational awareness by illustrating the idea that symbols have meaning and that this meaning is shared by others due to their conventional and symbolic nature (Martlew & Connolly, 1996). This study used participants who were receiving formal schooling and have done so since a young age. This is likely to positively influence the iconicity levels of the PCS for them.

Cognitive style, an oral or literate background and schooling are all individual variables that are likely to be influenced by culture. Culture is another important individual variable that will influence the iconicity of graphic symbols and, ‘Iconicity should be studied within the context of a culture,’ (Haupt & Alant, 2002, p. 40). Culture is, ‘a set of behaviours, institutions, beliefs, technologies, and values invented and passed on by a group of individuals to sustain what they believe to be a high quality of life and to negotiate their environments.’ (Taylor & Clarke, 1994, p. 103). Individuals pass on their cultural knowledge primarily through language and therefore culture cannot exist without language (Taylor & Clarke, 1994). Likewise, language is dependent upon culture, as culture influences and shapes the functionality of language, communication patterns, means of expression and the understanding of information (Hetzroni & Harris, 1996). ‘Language is a cultural phenomenon,’ (Huer, 2000, p. 180) and both symbolic and non-symbolic forms of communication are dependent on culture (Huer, 1997).

Graphic symbols are, for many individuals with LNFS, an important means of expressive language. As symbol learning and iconicity are bound in culture, time and experience (Beukelman & Mirenda, 1998), it is important to investigate the impact of culture on perceptions of graphic symbols (Huer, 2000). However, only a few symbol studies involving non-western populations exist. Nakamura, Newell, Alm, and Waller (1998) conducted a cross-cultural study of picture-based sentences constructed by adult English and Japanese speakers. Eighty Japanese speakers and 43 English speakers were asked to construct picture-based sentences using a computer-based system with PCS (Nakamura et al., 1998). The results of this study indicated that syntax markers and word order in English and Japanese affected the way in which pictorial sentences were created, clearly indicating the impact of different languages on the use of graphic symbols for communication (Nakamura et al., 1998).

Another cross-cultural study focussing on iconicity was conducted by Huer (2000). The study investigated the translucency ratings of three symbol sets, namely PCS, DynaSyms and Blissymbols by 147 adults from European-American, African-American, Chinese and Mexican cultural/ethnic communities. The results indicated statistically significant differences in the mean translucency ratings of the symbols within the three different symbol sets across the four participant groups, suggesting that culture/ethnicity influenced the translucency ratings. This implies that different language and life experiences influence the way in which graphic symbols are perceived. The results also showed that all four cultural/ethnic groups perceived PCS to be the most translucent and Blissymbols the least so.

Nigam (2003) argued two reasons that the Huer (2000) study cannot contend that culture/ethnicity influences the perception of graphic symbols. Firstly, her study did not assess the acculturation of the participants who were born and educated in America, thus affecting the generality of the study (Nigam, 2003). Secondly, it did not include enough nouns for evaluation (Nigam, 2003). Nouns may be more culturally sensitive than verbs as they may differ between cultures in shape and presentation, whereas verbs are more likely to remain the same across cultures (Nigam, 2003). This academic debate emphasises the complexity of cross-cultural research and indicates a need for careful analysis of potential biases in the test material used in such studies (Bornman et al., 2009).

Some iconicity studies have been conducted on different South African populations, providing alternative information to the more common Western perspective on the iconicity of symbols. Table 2.1 provides a summary and comparison of three iconicity studies using PCS and South African populations conducted between 2002 and 2008. A search of two databases, i.e. EBSCOhost and Scopus, provided articles on such studies using combinations of the following search parameters: *PCS*, *South Africa*, *transparency*, *translucency*, *iconicity* and *recognition*. This study's methodology is based on those of the first two articles by Haupt and Alant (2002) and Basson and Alant (2005) respectively.

Table 2.1

South African Iconicity Studies Using PCS

The iconicity of picture communication symbols for rural isiZulu children	The iconicity and ease of learning of picture communication symbols: A study with Afrikaans-speaking children	Which graphic symbols do four-year-old children use to represent each of the four basic emotions?
Authors • Haupt and Alant (2002)	Authors • Basson and Alant (2005)	Authors • Visser, Alant and Harty (2008)
Main Aim • To determine how accurately typically developing rural isiZulu children could identify 36 PCS presented thematically on a commercially available communication overlay, in response to spoken labels	Main Aims • To determine how accurately typically developing urban, Afrikaans-speaking children could identify 16 PCS presented thematically on a commercially available communication overlay, in response to spoken labels • To determine how accurately the children could recognise the 16 PCS after exposure to a learning experience	Main Aims • To determine whether four-year-old children were able to identify emotions represented as graphic symbols using 16 graphic symbols representing the emotions *happy*, *sad*, *afraid* and *angry* (4 symbols for each emotion) compiled using 14 PCS, one PICSYMS symbol and one Makaton symbol on an A4 page • To determine which specific graphic symbols four-year-old children identified as representing the four emotions
Research Design • An exploratory, analytical, quantitative survey design was used.	Research Design • A quasi-experimental control group design was used.	Research Design • An exploratory, descriptive design was used.
Participants • Ninety-four participants between the ages of 10;00 and 11;00 (years;months) • isiZulu first language • Typically developing	Participants • Forty-six participants between the ages of 06;00 and 06;11 (years;months) • Afrikaans first language • Typically developing	Participants • Twenty-six participants between the ages of 04:00 and 05,11 (years;months) • English first language • Typically developing
Tasks • To complete the survey using pen and paper – participants had to mark one PCS on a page for each of the 36 verbal labels read out by the researcher.	Tasks • To complete the pre-test using pen and paper – participants had to mark one PCS on a page for each of the 16 verbal labels read out by the researcher. • The experimental group received a training session regarding the PCS and their labels. • To complete the post-test using pen and paper	Tasks • Participants were required to point to one graphic symbol on an A4 page consisting of 16 graphic symbols, after listening to a question asked by the researcher – three questions were asked for each emotion, resulting in each participant being asked 12 questions in total.
Results • The iconicity of the selected 36 PCS was generally	Results • The iconicity of the selected 16 PCS was generally	Results • The participants were able to recognise the four

The iconicity of picture communication symbols for rural isiZulu children	The iconicity and ease of learning of picture communication symbols: A study with Afrikaans-speaking children	Which graphic symbols do four-year-old children use to represent each of the four basic emotions?
low for the participants. • The isiZulu participants had difficulty interpreting arrows and question marks present in 15 of the PCS. • Nouns were the most iconic out of the 36 selected PCS, being identified correctly more often.	low for all participants on first exposure (pre-test). • On first exposure (pre-test) all participants had difficulty interpreting arrows present in seven of the PCS. • The post-test results improved significantly for the experimental and control groups.	emotions represented as graphic symbols. • The emotion *happy* was the easiest to recognise in graphic form whereas *sad* and *angry* were the most difficult. • The participants used facial features to discriminate between the emotions represented in graphic forms. • The emotions *happy* and *angry* were more susceptible to individual influences.
Limitations • Use of a communication overlay within a specific theme may affect generalizability. • Limited application of the results for disabled children; the participants were typically developing.	Limitations • Relatively small sample size • Small number of PCS used • Use of a communication overlay within a specific theme may affect generalizability. • Limited application of the results for disabled children; the participants were typically developing.	Limitations • Relatively small sample size • The homogeneity of the sample reduces the generalizability of the results to other South African children of different cultures. • Limited application of the results for disabled children; the participants were typically developing. • Only four emotions were investigated. • Only one of the emotions (*happy*) is an expression of pleasure, which may account for it being recognised more easily than the other three (*sad, angry, afraid*), since expressions of pleasure are easier to discriminate. • The emotions were investigated within limited contexts, which may have affected the participants' symbol choice, since the manner in which an emotion is expressed is related to the intensity of the experience.

Table 2.1 summarised and compared three published iconicity studies using PCS in South African populations. This present study will be based on those conducted by Haupt and Alant (2002) and Basson and Alant (2005). The results from these two studies indicated that the iconicity of the selected PCS was generally low (Haupt & Alant, 2002; Basson & Alant, 2005). Furthermore, both studies showed that the South African participants had difficulty interpreting PCS involving arrows (Haupt & Alant, 2002; Basson & Alant, 2005). These results suggest that it is likely that the iconicity of the PCS used in this study will be low and that care should be taken when using PCS with arrows in further research with South African children as participants.

The results of the study conducted by Visser et al. (2008) indicated that the participants were able to recognise the four emotions (*happy, sad, afraid and angry*) represented as graphic symbols. They were also able to use facial features to discriminate between the four emotions. The emotion *happy* was the easiest to recognise in graphic form and the four PCS used to represent *happy* were more iconic to the participants than the other 12 symbols. These 12 symbols depicted expressions of displeasure (*sad, afraid and angry)* and were less iconic to the participants. Expressions of pleasure depicted in graphic symbols may be more iconic to young children (Visser et al., 2008). The results also indicated that the facial features depicted in the symbols enhanced their iconicity thereby aiding in their interpretation.

The three South African studies discussed in Table 2.1 were conducted on typically developing children. This study will differ in that the participants will have intellectual difficulties.

2.7 Individual effects pertaining to persons with intellectual disability

Four individual variables influencing the iconicity of graphic symbols, namely sensorimotor functioning, world knowledge, symbol experience and language competence, are particularly important to consider in case of individuals with intellectual disability. Using pictures or other graphic symbols to represent meaning is a relatively simple and straightforward task for adults with intact language and cognitive skills (Mineo Mollica, 2003). However, this is not the case for individuals with cognitive challenges, because they have reduced resources to rely on when interpreting graphic representations (Mineo Mollica, 2003). Consequently, iconicity is affected for these individuals. Sensorimotor functioning, world knowledge,

symbol experience and language competence are specifically vulnerable to deficits in individuals with intellectual disability and constitute additional influencing factors in the iconicity of graphic symbols for these individuals. These factors are discussed in further detail below, starting with the sensorimotor system.

The sensorimotor system works closely with the nervous system forming a communication channel to regulate incoming sensory and outgoing motor function providing a vital connection between the individual and the environment (Forney & Heller, 2004). Sensory systems enable a child to acquire increasingly complex skills across all developmental domains while the motor system allows children to explore and interact with their environment and practice developing skills (Forney & Heller, 2004). Many children with intellectual disabilities have a compromised sensorimotor system.

The visual sensory system is vital when considering the use of graphic symbols for an AAC system; processing data in the visual modality comes into play in almost every aspect of an aided AAC system (Wilkinson & Jagaroo, 2004). During typical spoken communication the auditory system carries all the linguistic-analytic information (Loncke, Campbell, England, & Haley, 2006). However, within AAC systems the majority of the linguistic characters need to be processed through the visual channel and consequently visual information processing may be more developed in individuals using AAC (Loncke et al., 2006). However, this advantage may not be gained when AAC users experience visual impairments.

Visual impairment is complex and the visual perception and interpretation system is intricate, with many components affecting its functioning (Sacks, 1998). The eye itself is a complex, three-layered structure controlled by muscles and ligaments and containing millions of neuroreceptors that send visual information via the optic nerve to the brain (Sacks, 1998; Silberman, Bruce, & Nelson, 2004). In addition, approximately 20 distinct areas of the brain, located across all four major lobes of the cortex, and in subcortical structures as well, have been identified as playing a role in higher-level cortical visual processing (Erin, 2002; Kaas, 2000; Mineo Mollica, 2003; Sacks, 1998; Silberman et al., 2004; Wilkinson & Jagaroo, 2004).

Although the visual acuity of the participants in this study will not be affected, it is very possible that individuals with intellectual disabilities have one or more aspects of the visual

processing system affected (Mineo Mollica, 2003). The five most prevalent disabilities associated with visual impairment in children from birth to three years are developmental delay, cerebral palsy, hearing loss, brain dysfunction and various syndromes associated with intellectual impairment (Hatton, 2001). In addition, the etiologies of visual impairments, such as prenatal factors, hypoxia, genetic and chromosomal defects and prematurity to name but a few, may also result in intellectual disabilities (Silberman et al., 2004). Therefore, it is likely that many individuals with intellectual disability may have a compromised visual system that will influence the iconicity of graphic symbols for them.

Associations between symbols and referents can only be made once an individual can recognise and discriminate visual forms (Sevcik, Romski, & Wilkinson, 1991). Visual recognition of and discrimination skills relating to graphic symbols first require the ability to visually attend to the two-dimensional picture and to then discriminate the figure from the background – figure-ground discrimination (Stephenson & Linfoot, 1996). However, the thin lines that form many of the commercially available symbol sets/systems may hinder the successful achievement of this process for an individual with a compromised visual processing system, and therefore reduce the potential for iconicity to aid in the recognition of graphic symbols (Mineo Mollica, 2003).

Sensorimotor difficulties result in reduced sensory and motor exploration, thereby restricting perceptual, language, social and cognitive development (Forney & Heller, 2004). Therefore, the child with sensorimotor difficulties is likely to present with a more limited world knowledge.

World knowledge refers to an understanding of the relationships between oneself and environmental people and objects (Rowland & Schweigert, 2003). It is based upon previous experiences and their perceived value, which will shape the expectations regarding future behaviour (Rowland & Schweigert, 2003). These expectations will govern interactions, as well as provide a common knowledge base to facilitate meaningful communication (Rowland & Schweigert, 2003). World knowledge encompasses a mixture of procedural, declarative, episodic and semantic knowledge stored in the long term memory and is necessary for optimal functioning in daily life (Light & Lindsay, 1991). Procedural memories are not consciously accessible and refer to skills such as riding a bicycle or operating a machine (Ward, 2006). In terms of AAC, knowing how to operate the AAC system would be stored as

a procedural memory (Light & Lindsay, 1991). In contrast, declarative knowledge would enable the AAC user to know what to say (Light & Lindsay, 1991). Within declarative memory two distinctions can be made – semantic memory and episodic memory (Ward, 2006). Semantic knowledge is conceptually based and includes information about the world such as people, places and the meaning of objects and words. It is culturally shared and acquired from interactions and encounters with the world (Ward, 2006). It also includes knowledge of language syntax, semantic and pragmatics and is context free and normally acquired without conscious effort (Ward, 2006). Typically, AAC systems are organised semantically and rely on semantic memory for efficient use (Light & Lindsay, 1991). Episodic memory, on the other hand, involves biographical information and the memories are specific in time and place (Ward, 2006). It develops through new personal experiences in a variety of environments (Ward, 2006). This suggests the importance of providing children using AAC with opportunities to participate in a variety of life experiences (Light & Lindsay, 1991).

World knowledge is used to successfully solve problems, perform tasks, interact with others and to participate in any type of cognitive activity (Light & Lindsay, 1991); it is dependent on experience in and of the world (Rowland & Schweigert, 2003). New information gained from experiences requires deep processing in order to be remembered and deep processing requires the interpretation and elaboration of the new information in terms of prior experience and knowledge (Light & Lindsay, 1991). Memory for new information is generally poor in the absence of prior knowledge (Light & Lindsay, 1991). In other words, one needs knowledge to acquire knowledge, and new knowledge for a developing child can only be obtained through a variety of day-to-day experiences.

Children using AAC face a fundamental problem in acquiring knowledge in that they are often severely restricted in their life experiences as a result of intellectual and/or physical disabilities (Light & Lindsay, 1991). Physical disabilities, as well as overprotective caregivers, restrict the ability/probability of the child to explore his/her environment (Light & Lindsay, 1991). In addition, basic caregiving activities for children with intellectual and/or physical disabilities such as feeding, bathing, dressing and toileting may require so much time and effort from the caregiver that little time or energy is left for other learning experiences (Light & Lindsay, 1991). Furthermore, many school programmes for children with disabilities lack learning opportunities and literacy experiences (Light & Lindsay, 1991). These factors

hinder the development of a broad world knowledge from which the iconicity of graphic symbols may be drawn. The features of a symbol that may be meaningful to an individual may be less than meaningful to an individual using AAC due to limited life experience with that symbol and its referent (Rowland & Schweigert, 2003).

Previous experience with symbols will influence the iconicity of graphic symbols for an individual (DeLoache, 1991; Stephenson & Linfoot, 1996). Experience with picture recognition and use assists an individual to perceive the similarity between a picture and a referent and to see this similarity as a relationship between the picture and referent (Stephenson & Linfoot, 1996). Experience with pictures allows young children to learn that pictures are objects by themselves and do not have the same function as the object they depict (Stephenson, 2009a). This is important in facilitating the understanding of the symbolic potential of pictures (Stephenson, 2009a) and is illustrated by DeLoache's (1995) model of symbol development. The model is based on her work with typically developing children's use of scale models, miniature objects and pictures; a discussion of the model follows below.

The pivotal achievement of symbolic behaviour, termed representational insight, can be seen when children recognise some kind of a relationship between a referent and its symbol (DeLoache, 1995). Iconicity is one of the factors that influence the achievement of representational insight (Stephenson, 2009a). The more a symbol resembles its referent, the easier it is to determine a visual relationship between the two (DeLoache, 1995).

However, representational insight alone does not signify true symbolic behaviour; an understanding of dual representation is necessary to allow a child to use symbols for referents (DeLoache, 1995). Dual representation is the ability to view a symbol as an object in itself, as well as an object representing a referent (DeLoache, 1995). That is, a simultaneous understanding of the concrete and abstract nature of a symbol. Dual representation enables the child to realise that the referent and the symbol share meaning, but that they cannot be treated or handled in the same manner (Mineo Mollica, 2003).

The most mature form of symbolic behaviour is indicated by symbolic sensitivity, which is a general readiness to look for and identify symbolic relationships (DeLoache, 1995). The child will generalise use of symbolic behaviour by looking for and identifying novel situations for symbolic representation, thereby becoming a flexible symbol user (DeLoache, 1991).

Development of symbolic sensitivity relies on exposure to and experience with symbolic relationships, indicating that symbolic development in general is cumulative (DeLoache, 1991). However, it is likely that children with severe disabilities do not have the same experiences with pictures and books at home or at school (Light, Binger, & Kelford Smith, 1994). This may hinder their symbolic development, as well as reduce their opportunities to learn various associations that may increase the iconicity of graphic symbols. Furthermore, a limited range of symbolic experiences will reduce flexibility in symbol understanding and use (Namy, Campbell, & Tomasello, 2004).

The development of the use of pictures as symbols can also be seen within the framework of DeLoache's model of symbol development (Stephenson, 2009a). To use a picture as a symbol, representational insight into the picture must be achieved in that the child must perceive the similarity between the picture and the referent and use this perceptual relationship to understand what the picture represents (Stephenson, 2009a). For the development of dual representation the child must be able to differentiate between the picture as a flat object and also as a representation of something else (Stephenson, 2009a). Dual representation appears to be more easily achieved using pictures as symbols, as opposed to miniatures and scale models because, primarily, pictures represent something else and one looks for this representation in a picture, rather than looking at the picture as an object in itself (DeLoache, Kolstad, & Anderson, 1991). Therefore, pictures may be more appropriate communication symbols for individuals with intellectual disability than objects or miniatures, because the reduced iconicity of pictures may enhance the understanding of dual representation, thereby encouraging the use of the picture as a symbol (Stephenson, 2009a).

Children who acquire spoken language have constant exposure to and experience with an environment rich in the symbolic language they are learning (Von Tetzchner & Grove, 2003). They have continuous opportunity to experience their linguistic system being used efficiently by numerous competent adults (Von Tetzchner & Grove, 2003). However, for children learning to use graphic symbols for communication, no such natural language environment of competent users exists (Von Tetzchner & Grove, 2003). The adults in these children's environment are unlikely to have personal experience with the graphic symbols and cannot provide a model of their use in its mature form (Renner, 2003). Consequently, these children have very limited exposure to and experience with the symbol system they are trying to learn and little opportunity to practice its use (Von Tetzchner & Grove, 2003).

In addition, the opportunity for more competent language users to scaffold communication interactions for children using AAC is largely reduced. Scaffolding refers to the process whereby more competent individuals in the child's environment support the development of abilities by guiding the child's own problem solving (Renner, 2003). All young children need scaffolding to express themselves. However, an environment which provides scaffolding that will support the development of language in children using AAC does not seem to come naturally (Von Tetzchner & Grove, 2003). More elaborate and adapted forms of scaffolding are needed, with which parents and other regular communication partners are unfamiliar with (Von Tetzchner & Grove, 2003). Also, the communication difficulties of children using AAC may complicate the communication process, making scaffolding more difficult for caregivers (Von Tetzchner & Grove, 2003). For these reasons the scaffolding provided to children using AAC is often limited and likely to impact on their developing language skills.

The final individual variable that will influence the iconicity of graphic symbols is language competence. This is particularly relevant in South Africa due to the high incidence of multilingualism. Multilingualism in urban areas of South Africa has significantly increased since greater freedom of movement became possible under the new constitution (De Klerk, 2002). Parents were also afforded the right to place their children in an educational institution of their choice resulting in classes composed of learners and teachers from diverse cultural and linguistic backgrounds (Naudé, 2005). In urban areas, particularly in the province of Gauteng, many languages are represented in the classroom, the majority of which are African languages (Du Plessis & Naudé, 2003). Furthermore, many of the learners come from multilingual homes (Du Plessis & Naudé, 2003).

Education in the home language/mother tongue for the first years is strongly advised internationally and also by South African national educational authorities (Naudé, 2005). However, many parents in South Africa prefer and specifically choose educational institutions in which the LoLT is English (Naudé, 2005). Many African parents view English as a status symbol and the language of economic advancement and therefore encourage their children to learn and use it (Lafon & Webb, 2008). The African languages are still used extensively domestically and personally, as well as for cultural and religious practices; however, they generally have a lower public status than English has (Webb & Sure, 2000). There are many other reasons as to why many South African parents choose English as the language of education for their children, ranging from political to personal to purely practical (Naudé,

2005). Whatever the reason, English becomes an additional language used by the learners and the language of mutual understanding between the parents, teachers and learners (Naudé, 2005).

Consequently, for learners with LNFS, AAC systems are often implemented in English, which is generally not the learner's home language. Also, due to the frequent presence of additional disabilities, they may already have compromised language abilities. Therefore, these learners' level of English language competence varies greatly, and must be considered when teaching the use of any symbol system.

Language requires an individual to, 'organise and interpret the world through a system of symbols and referents' (Barton, Sevcik, & Romski, 2006, p. 10). The limited language skills of individuals with severe intellectual disabilities reduce their ability to use iconicity for interpreting graphic symbols (Mirenda & Locke, 1989; Sevcik et al., 1991). If an individual is learning to match a graphic symbol to a word he/she comprehends, the iconicity of the graphic symbol may enhance learning (Barton et al., 2006). However, if the individual does not understand the referent, then a similarity between it and the graphic symbol cannot be established, because the iconic symbol appears arbitrary (Barton et al., 2006). In this case the individual is not only learning the symbol, but also the referent and therefore may map any symbol to the referent, be it iconic or opaque (Barton et al., 2006).

Sevcik and Romski (1986) conducted a study into the representational matching skills of children and adults with severe intellectual disabilities using objects, line drawings and photographs. Half the participants had some functional language and comprehension, whereas half did not (Sevcki & Romski, 1986). The results showed that individuals with severe intellectual disabilities but with functional language skills were able to match objects to photos and line drawings, whereas those individuals without functional language and little comprehension were unable to match objects to line drawings (Sevcki & Romski, 1986). Mirenda and Locke's (1989) study comparing the translucency of 11 different types of symbols, previously referred to in Section 2.3, found that severely intellectually disabled children and adults with poor spoken language comprehension performed more poorly than those with functional language. Barton et al. (2006) conducted a study with four preschool children with severe intellectual disabilities using Blissymbols and lexigrams. The results

indicated no differences between the learning of opaque and comparatively iconic symbols, and that better language comprehension skills appeared to result in better symbol learning.

These studies show that improved language function increases the understanding and use of iconicity of graphic symbols. The key to making the symbol-referent association seems to be the language comprehension skill that the individual brings to the task (Barton et al., 2006).

Table 2.2 below summarises a number of iconicity studies conducted with individuals with intellectual disabilities from 1986 - 2011. A search of two databases, EBSCOhost and Scopus, provided articles detailing seven such studies, all of which have been discussed to some degree earlier in this chapter. The parameters used in the search for these studies included combinations of the following words in the title and abstract of the articles: *mental retardation, learning difficulties, intellectual disabilities, cerebral palsy, matching skills, iconicity, transparency* and *translucency*.

Table 2.2

Iconicity Studies with Individuals with Intellectual Disabilities

Authors	Aim	Participant description	Age range (years;months)	Speech and language skills	Symbols	Task	Results
Sevcik and Romski (1986)	To assess matching abilities	8 individuals with severe intellectual disability (ID)	09;02 – 22;06	• Group 1 (G1) – no functional language • Group 2 (G2) > 10 words	• Objects • Colour photographs • Line drawings	• Identity match – object to object; photograph to photograph; line drawing to line drawing • Nonidentity match – object to photograph; object to line drawing; photograph to line drawing	• G2 with some functional language skills performed better on all matching tasks. • As representational complexity increased, greater difficulty in matching was seen in G1 with no functional language skills.
Mirenda and Locke (1989)	To compare transparency of 11 symbol sets	• 22 individuals with severe ID • 14 individuals with moderate ID • 4 individuals with mild ID • Total of 40 • 10 individuals of the total 40 with autism	03;11 – 20;10	No functional speech	• Miniatures • Objects • Identical colour photographs • Non-identical colour photographs • Black and white (B&W) photographs • Picsyms • Self-talk • PCS • Rebus • Blissymbols • Written words	• 29 participants could match symbols to spoken words • 1 participant could verbal yes/no response when symbol labelled by researcher • 10 participants could matching the symbols to objects	• A hierarchy of iconicity was established ranging from easiest to hardest: objects, colour photographs, B&W photographs, miniatures, B&W line symbols, Blissymbols and written words. • Participants with poor comprehension performed more poorly than those with some functional language skills.

Authors	Aim	Participant description	Age range (years;months)	Speech and language skills	Symbols	Task	Results
Mizuko and Reichle (1989)	To compare transparency and recall of nouns, verbs and descriptors for 3 symbol sets/systems	21 adults with ID	22;04 – 61;07	• Speaking • Vocabulary scores between 2 – 5 years on the Peabody Picture Vocabulary Test	• Blissymbols • Picsyms • PCS	Match symbols to spoken words	• Picsyms and PCS were more transparent and easier to recall than Blissymbols. • Nouns were more easily identified and recalled, with no significant difference for verbs and descriptors.
Barton, Sevcik and Romski (2006)	To compare the learning of arbitrary Lexigrams with comparatively more iconic Blissymbols	4 children with severe ID	02;04 – 03;08	• 3 participants with LNFS, 2 of which were using 6 manual signs • 1 participant using at least 10 spoken words and some word combinations	• Lexigrams • Blissymbols	• Learn 3 Blissymbols and 3 Lexigrams • Match symbols to photographs and visa versa	• No differences in the learning of the opaque symbols versus the comparatively iconic symbols • Better comprehension skills appeared to result in better symbol learning ability.
Stephenson (2007)	To assess the effect of colour on the recognition and use of line drawings	10 children with severe ID	04;00 – 07;11	• Poor comprehension of spoken words • 2 participants with some spontaneous picture use for communication	• Objects • Coloured line drawings matching the object colour (colour match) • Coloured line drawings not matching the object colour (colour non-match) • B&W line	• Match drawings to object • Use of drawings for choice-making	• For some participants colour match between symbol and referent enhanced iconicity. • No participant showed a preference for a specific type of drawing – colour match, colour non-match or B&W.

Authors	Aim	Participant description	Age range (years;months)	Speech and language skills	Symbols	Task	Results
					drawings		
Stephenson (2009b)	To assess the effects of colour and outline shape on the recognition and use of line drawings.	17 individuals with severe ID	04;00 – 18;11	• LNFS • Using pictures for receptive and/or expressive communication • 13 participants were using pictures for some expressive communication	• Objects • Coloured line drawings • B&W line drawings • The colour and shape remained constant. The objects changed in colour and shape	• Match drawings to objects • Use of drawings for choice-making	• Varying the colour and outline shape correspondences between objects and line drawings had no significant effect on line drawing recognition and use.
Emms and Gardner (2010)	To compare two graphic symbol teaching methods and to determine the relationship between iconicity and teaching method	14 children with physical and learning disabilities	Class 1 – mean age of 09;02 Class 2 – mean age of 15;08	• 10 participants with LNFS	• PCS	• Learn and recall 36 transparent PCS and 36 translucent/opaque PCS • Match PCS to spoken word	• Overall, the direct teaching method provided better recall results. • The direct-teaching method is necessary for the learning of translucent/opaque PCS, especially for younger children. • The teaching method is not so critical in the learning of transparent PCS.

Legend:

ID = Intellectual disability G1 = Group 1 G2 = Group 2 B&W = Black and white PCS = Picture Communication Symbols

LNFS = Little or no functional speech

Table 2.2 details five iconicity studies conducted with individuals with intellectual disabilities. All of these studies involved participants from western countries. This study will differ in that the participants with intellectual disabilities will represent a non-Western culture.

DeLoache and her colleagues corroborated the importance of language skills in understanding and using symbols (DeLoache et al., 1991; DeLoache et al., 1999; DeLoache & Sharon, 2005). They conducted studies involving typically developing children aged 36 months and younger. Their use of objects and pictures as symbols indicated that iconicity did not aid children under the age of 30 months in using objects and pictures as symbols (DeLoache et al., 1991; DeLoache et al., 1999; DeLoache & Sharon, 2005).

Although iconicity can aid the child's development of representational insight, it may hinder the understanding of dual representation (DeLoache, 1995). Very high levels of iconicity, such as those seen between miniatures and their object referents, can reduce the child's appreciation of the miniatures' symbolic status (DeLoache, 1995). The increased salience of a highly iconic symbol can create a keen interest in the concrete nature of it, thereby preventing its mental representation as an abstract symbol (DeLoache, 1995). The child may become so interested in the object itself that he/she fails to perceive its symbolic potential. By implications these studies suggest that, for individuals with severe intellectual disabilities who have little or no comprehension and use of spoken language, iconicity is not a crucial variable in symbol learning and that the use of arbitrary graphic symbols may be equally effective (Stephenson, 2009a).

Clinicians must pay careful attention to the language skills, previous symbol experiences and the stage of symbolic development of individuals with intellectual disabilities to determine whether or not iconicity is necessary for symbol acquisition. It is also important to understand whether or not iconicity will play a role in the processing of the graphic symbols with this population.

It appears that comprehension of spoken language indicates an achievement of symbolic functioning that will allow the individual to transmit his/her existing conceptual and linguistic knowledge to other symbolic representations of language (Sevcik et al., 1991). Experience with one form of representation, such as spoken language, appears to aid the understanding

and use of another form (Stephenson & Linfoot, 1996). Therefore, improved language skills of persons with intellectual disabilities are likely to enhance their ability to utilise the iconicity of graphic symbols to their learning advantage (Barton et al., 2006; Sevcik et al., 1991; Stephenson, 2009a).

The question that arises, is if iconicity is not an important factor in symbol learning for individuals with severe intellectual disabilities, then why use iconic symbols at all? The answer lies in the environment in which these individuals find themselves. The literacy levels in South Africa are lower than average and few individuals with disabilities are literate (Bornman et al., 2011). Furthermore, the frequent communication partners of these individuals are also often illiterate (Bornman et al., 2011). Therefore, the iconicity of symbols becomes important to aid in their understanding and use. Also, in South Africa's multilingual society many communication interactions involve at least two languages (Bornman et al., 2011). An individual using AAC may have communication partners using different languages who may not understand a gloss written in one language (Bornman et al., 2011). Again, the iconicity of the symbols will have to be relied upon for interpreting their meaning.

In addition, one must consider what symbol sets and systems are available for use. PCS are readily available and widely used in South Africa. The results of a survey conducted indicated that PCS are used extensively in South Africa, particularly amongst school-aged children with complex communication needs (Bornman et al., 2011). South African speech-language therapists and educators implementing AAC are likely to have more experience with using PCS than other symbol sets and systems. Finally, more iconic symbols, such as PCS, can be adapted to make them more culturally relevant. This is an important consideration in environments such as South Africa with its wide cultural diversity. Therefore, information regarding the iconicity of PCS for children with EAL and intellectual disabilities within the South African context is valuable.

2.8 Summary

This chapter reviewed the theoretical background of this study within a framework of potential influencing factors on the iconicity of graphic symbols. The iconicity of graphic symbols for individuals with intellectual disability was emphasised and the value of research into PCS iconicity for children with EAL in South Africa was indicated.

Chapter 3
Research Methodology

3.1 Introduction

The aim of this chapter is to discuss the research methodology used in this study. Firstly, the aims of the study are outlined in terms of its main and sub-aims. Secondly, the research design and the three phases of research involved in this study, namely material development, the pilot study and the main study, are discussed. The methodology of the main study is subsequently discussed in terms of participant selection criteria, ethical considerations, data collection procedures and equipment and materials. Data analysis is described and finally the issues surrounding reliability and validity are detailed.

3.2 Aims

The main aim will be described first, followed by the five sub-aims by which the main aim was realised.

3.2.1 Main aim

The main aim of this study is to determine the iconicity of 16 Picture Communication Symbols (PCS) presented on a themed 'bed-making' overlay, for 12 - 15-year-old children with English Additional Language (EAL) and intellectual disability.

3.2.2 Sub-aims

The sub-aims of this study are:

- To determine the frequency with which the PCS were selected as target and non-target PCS
- To describe the iconicity of the 16 PCS, including the PCS with the highest and lowest frequency counts as target PCS
- To determine the frequency of target PCS selections across the word classes
- To analyse the frequently selected non-target PCS selections in terms of which target PCS they were selected instead of and why
- To determine the correlation between the participants' total frequency selections of target PCS and their English vocabulary scores

3.3 Research design and research phases

A quantitative, nonexperimental, descriptive design was used because it is appropriate to address the aims of this study. Quantitative research designs are objective in measuring and describing data by using numbers and statistics (McMillan & Schumacher, 2010). A nonexperimental design was selected because there was no manipulation of conditions and no form of intervention (McMillan & Schumacher, 2010). Overall, the methodology for this study was based on that of two similar studies conducted by Haupt and Alant (2002) and Basson and Alant (2005) respectively.

This study comprised three phases. The first phase was the development of material, which involved an expert panel review and a peer panel review to adapt the measuring instrument to be appropriate for participants in this study. Phase 2 involved the pilot study and Phase 3 the main study.

3.4 Development of material (Phase 1)

The steps followed in the development of the measuring instrument used in this study are discussed, starting with a critical discussion of similar existing measuring instruments. The two panel reviews undertaken to assist in the development of the 'bed-making' overlay are described and, finally, the process of compiling the training and trial overlay is outlined.

3.4.1 Critical description of existing measuring instruments

The measuring instrument used in this study was based on one used by Haupt and Alant (2002) on the iconicity of PCS for typically developing 10-year-old isiZulu-speaking children, as well as on one developed by Basson and Alant (2005) in their study of the iconicity and learnability of PCS for typically developing 6-year-old Afrikaans-speaking children. Haupt and Alant's (2002) measuring instrument consisted of six pages of a training overlay and 36 pages of a communication overlay. The training overlay, used for screening and training of the participants, consisted of 26 written isiZulu words and 10 line drawings judged by the researchers to be highly guessable to the participants (Haupt & Alant, 2002). The communication overlay was a commercially available one designed by Goosens, Crain, and Elder (1996) around the theme of making a bed (Haupt & Alant, 2002). It consisted of 36

black and white PCS depicted in six rows of six on an A4 page with the glosses excluded (Haupt & Alant, 2002).

The 'bed-making' communication overlay used by Haupt and Alant (2002) was selected from a set of five possible overlays with the help of three judges with isiZulu as first language and experience working with children in their target population. This allowed for the basic content of the overlay to be culturally appropriate for the target population in that the concepts represented on it formed part of the children's world knowledge (Blachowicz, 1994). However, the PCS themselves were not judged for their representativeness of the concepts to the target population. In addition, the training overlay designed by Haupt and Alant (2002) did not use isiZulu words or line drawings from a published source that indicated they were suitable for the target population in terms of age or culture.

Basson and Alant's (2005) measuring instrument consisted of six pages of a pre-test training overlay used for screening and training of the participants, and 16 pages of a communication overlay. The pre-test training overlay consisted of 16 black and white line drawings known to six-year-old Afrikaans speaking children (Basson & Alant, 2005). Ten of them were taken from the training overlay used in Haupt and Alant's study (2002) and the remaining six were drawn from a corpus of pictures familiar to the age group (Basson & Alant, 2005). The communication overlay used by Basson and Alant (2005) was also a themed 'bed-making' overlay. However, it depicted 16 black and white PCS presented in four rows of four instead of 36. Basson and Alant's (2005) participants were younger than those in Haupt and Alant's (2002) study and a pre-pilot test indicated that the 36 PCS overlay was likely to be overwhelming and tiring for their six-year-old participants (Basson & Alant, 2005). A commercially available 16 PCS 'bed-making' communication overlay could not be found and therefore one was compiled (Basson & Alant, 2005). All 16 PCS used by Basson and Alant (2005) were also used on the overlay used by Haupt and Alant (2002), also without the glosses.

After the compilation of the 'bed-making' overlay and the translation of the glosses into Afrikaans, the researchers discussed the 16 PCS with a Grade R teacher at the pilot nursery school (Basson & Alant, 2005). She felt that the target age group would understand the Afrikaans words, were familiar with the concepts they depicted and would be able to identify some of the symbols (Basson & Alant, 2005). However, no formal measures were used to

ensure that the PCS and their glosses were age and culture appropriate. This was also the case for the line drawings and glosses used on the pre-test training overlay.

This present study also used a themed, PCS, 'bed-making' overlay (Appendix A). As the participants in this study had intellectual disabilities, 16 PCS were used because a 36 PCS overlay may have been too demanding on the participants' attention and visual scanning skills. In order to adapt Haupt and Alant's (2002) and Basson and Alant's (2005) overlays for use in this study a three-step process was followed.

Firstly, 16 PCS were selected from the two original overlays. The results of both the Haupt and Alant (2002) and Basson and Alant (2005) studies indicated that typically developing isiZulu-speaking and Afrikaans-speaking children had difficulty interpreting the arrows that were used in some of the PCS. Therefore, this study only used PCS without arrows. Nine PCS without arrows were selected from the Basson and Alant (2005) overlay; those with arrows were excluded. To select the required seven PCS that remained, all the PCS without arrows on the Haupt and Alant (2002) overlay were placed in a hat and seven of these were randomly selected. The rest were excluded. This resulted in the 16 PCS without arrows for potential use on this study's overlay. Appendix B outlines this preliminary PCS selection procedure. Secondly, the 16 PCS were reviewed by an expert panel and, lastly, by a peer panel. The two panel reviews were conducted to ensure the linguistic and cultural appropriateness of the selected PCS and their glosses and are described respectively in Sections 3.4.2 and 3.4.3 that follow.

3.4.2 Expert Panel Review

An expert panel review (comprising six teachers) of the selected 16 PCS and their glosses for potential use on this study's overlay was conducted. The aim of this panel review was to ensure that the PCS were representative of the concepts they depicted, and that the glosses were understandable to the main participants with EAL and intellectual disability in this study. Six teachers who currently teach at a school for learners with special educational needs (LSEN) were asked to participate. All the teachers were required to have had experience working with children with intellectual disabilities and EAL, and three teachers were required to have EAL themselves, and not English as a first language. Informed consent was obtained from the school principal and participating teachers respectively prior to the commencement of the expert panel review (Appendices C and D). The teachers were then provided with an

expert panel review questionnaire which commenced with questions pertaining to their biographical detail and teaching experience information (Appendix E).

All six of the participating teachers were female. Four were over the age of 50 years and two were between 41 and 50 years. All of them had more than 10 years teaching experience, five had more than 10 years teaching experience with children with disabilities and one had between six and 10 years teaching experience with children with disabilities. Two of the teachers had obtained an honours degree, three a teaching diploma and one a diploma in special education. Three of the teachers had had in-service AAC training, two had had no training in AAC and one had attended an AAC workshop. At the time of the study, all the teachers worked with children that fell into the age range of the main participants in this study. Two of the teachers had English as a first language, one had Afrikaans, one isiZulu, one isiXhosa and one Sesotho. All the teachers were also competent in at least one other language. A summary of their biographical and teaching experience information is depicted in Table 3.1.

Table 3.1

Teachers' Biographical Information, Qualifications and Teaching Experience

Teacher	1	2	3	4	5	6
Gender	Female	Female	Female	Female	Female	Female
Age	Over 50 years	Over 50 years	Between 41 and 50 years	Between 41and 50 years	Over 50 years	Over 50 years
Home language	isiZulu	Sesotho	Afrikaans	English	English	isiXhosa
Qualification	Honours degree	Teaching diploma	Teaching diploma	Teaching diploma	Honours degree	Teaching diploma in special education
Years of teaching experience	More than 10 years	More than 10 years	More than 10 years	More than 10 years	More than 10 years	More than 10 years
Years of teaching experience with children with disabilities	More than 10 years	More than 10 years	More than 10 years	More than 10 years	Between 6 and 10 years	More than 10 years
Extent of AAC training	In-service training	None	None	In-service training	In-service training	Workshop

Table 3.1 shows the six teachers' biographical information and indicates that they are experts in the field of teaching children with EAL and intellectual disabilities.

After the questions regarding the teachers' biographical and teaching experience information, the teachers were required to complete two more sections in which they were asked to judge the 16 PCS in terms of:

- Whether or not the main participants would understand the vocabulary in the glosses
- The representativeness of the PCS to its referent/gloss

To do this the teachers were asked one question regarding the glosses and one question regarding the PCS (Appendix E). The question pertaining to the glosses was, 'Do you think 12 - 15-year-old children with EAL and mild intellectual disability will understand the following words/phrases?' Three options for answers to this question were provided, namely 'Yes', 'No', and 'Unsure'. Space for additional comments and suggestions was provided.

The question regarding the representativeness of the PCS was, 'How well do you think 12 - 15-year-old children with EAL and mild intellectual disability will match the words to their symbols?' This question was accompanied by a three point Likert scale for answering. The three Likert points were 1 = The symbol doesn't represent the meaning of the word/s at all; 2 = The symbol represents the meaning of the word/s a little; 3 = The symbol represents the meaning of the word/s a lot. Space was provided on the questionnaire for the teachers to make comments or suggestions for change to the glosses and/or the PCS. The entire questionnaire took about 45 minutes to complete.

Once the questionnaires were completed and returned to the researcher, the answers and suggestions were analysed and considered. Regarding the glosses, changes were made to the ones for which 50 % or more teachers answered 'No' or 'Unsure', indicating that the gloss might not be understood by the participants. Only two glosses met this criterion:

It looks like a bomb went off
Put it in the hamper

'It looks like a bomb went off' was indicated for revision by 83 % of the teachers. Two teachers indicated that the participants would be unfamiliar with the vocabulary and one

indicated that the sentence was too abstract because the expression was idiomatic. Therefore, 'It looks like a bomb went off' was excluded and substituted with a PCS and gloss for 'Put it on', as this seemed a more concrete referent and the word 'on' was also indicated as a word for an initial expressive sign lexicon by Fristoe and Lloyd (1980). 'Put it in the hamper' was indicated for revision by 50 % of the teachers. One teacher suggested using 'laundry basket' in place of 'hamper'. It was decided to use 'washing basket' instead of 'laundry basket' because the word 'wash' is indicated as a word for an initial expressive sign lexicon by Fristoe and Lloyd (1980).

The results regarding the PCS were analysed by calculating a total score for each PCS out of a possible score of 18 points. The points were allocated according to which Likert point the teacher circled for each PCS (1 = The symbol doesn't represent the meaning of the word/s at all; 2 = The symbol represents the meaning of the word/s a little; 3 = The symbol represents the meaning of the word/s a lot). All PCS that obtained a total score of nine or less, which indicated that they may not be representative of the concepts they depicted were either adapted or replaced. These results are presented in Appendix F.

The PCS results of the expert panel review revealed consensus among the teachers. Four symbols, for the glosses 'It looks like a bomb went off', 'They're dirty', 'Put it in the hamper' and 'It's nice and soft', were indicated for revision by 100 % of the teachers. The PCS and gloss for 'It looks like a bomb went off' were replaced entirely by one for 'Put it on'. This PCS was randomly selected from the remaining ones without arrows on Haupt and Alant's (2002) 'bed-making' overlay. Regarding the PCS for 'They're dirty', two teachers suggested using a PCS involving dirty clothes and one suggested that there be two or more dirty clothing items depicted as the gloss contains the form 'They're', indicating plural. Therefore, the PCS of a dirty white piece of paper was replaced by a PCS of two, dirty, white T-shirts. For the symbol for 'Put it in the hamper' one teacher suggested using a picture of a round washing basket, more commonly seen in South Africa than the square one depicted. This change was made. Finally, for the symbol for 'It's nice and soft' two teachers explained that the cloud PCS was too abstract to depict 'soft' for the participants. One teacher suggested replacing it with the PCS for 'Squish' instead. This suggestion was followed but the gloss 'It's nice and soft' remained. Appendix G illustrates these changes. The four revised PCS and the remaining 12 original PCS were then reviewed by a peer panel.

3.4.3 Peer panel review

A peer panel review of the 16 PCS and their glosses to be used on the 'bed-making' overlay was conducted by the researcher with six typically developing children with EAL between the ages of 09;00 and 9;11 (years;months) from a mainstream, government school. The aim of the peer panel review was to determine whether the vocabulary in the glosses was understandable and whether the PCS were representative of the concepts they depicted. The participants for the panel review were younger than those in the main study, providing a closer match to the cognitive functioning of the intellectually disabled main study participants. It is necessary to ensure that typically developing children with similar traits as the participants in the main study can understand the PCS and their glosses to be used in the measuring instrument. If the typically developing children do not, it is likely that the participants with intellectual disabilities will not understand them either; such an occurrence would negatively impact on the results of the study.

Informed consent was obtained from the school principal and participants' parents respectively before the commencement of the peer panel review (Appendices H and I). The parents also completed a biographical information form (Appendix J).

Three boys and three girls in Grade Three with a mean age of 09;03 (years;months) reviewed the 16 PCS. They met the same selection criteria as those used for the participants in the main study (Section 3.6.1, Table 3.5), except for the lower age range and absence of intellectual disability. They met the criterion of never having failed a Grade to ensure cognitive functioning in the typical range. Three of the participants used Sestwana as a home language, two used Sepedi and one Siswati. All the participants were competent in English, since English was the LoLT in which they were being educated. Table 3.2 provides a summary of their biographical information.

Table 3.2

Peer Panel Review Participants' Biographical Information

Peer panel participant	1	2	3	4	5	6
Gender	Male	Male	Male	Female	Female	Female
Age (years;months)	09;06	09;00	09;06	09;06	09;01	09;01
Home Language	Sestwana	Siswati	Sepedi	Sepedi	Setswana	Setswana
Additional Home Language	English	English	English	English	English	English
LoLT	English	English	English	English	English	English

Table 3.2 depicts the biographical details of the participants emphasising their biographical similarity to the participants in the main study, except for the absence of an intellectual disability.

Assent was obtained from each participant individually as described in Section 3.6.4. Each assenting participant reviewed the 16 PCS and their glosses individually with the researcher in a quiet room. The session lasted approximately 20 minutes. A scripted routine was used to ensure administration consistency. Before the commencement of the review the researcher provided the participants with a PCS for 'Stop' and explained that they could point to the symbol at any time, should they wish to stop participating in the process. The review comprised two sections pertaining to:

- Whether or not the participants understood the main vocabulary in the glosses
- The representativeness of the PCS to its referent/gloss

To address the first section the researcher asked the participants to write a sentence with the main vocabulary in the 16 glosses (Appendix K). For example, 'Write a sentence with *let me*.' The researcher wrote down the sentences produced by the participants. Participants scored one point for producing a semantically appropriate sentence involving the target word/phrase, thereby indicating understanding of the word/phrase. Each word/phrase could, therefore, achieve a potential total score of six. The words/phrases that achieved a score of three or less were changed. Only one phrase required change, since it achieved a score of only two out of six. This phrase was 'pillow case' and it was changed to 'pillow'.

The second section of the review involved the participants rating the level of representativeness of the PCS to its referent/gloss using a three point Likert scale (Appendix K). For example, 'How much does this picture look like *make the bed*?' The three Likert scale points for answering were: 1 = A lot; 2 = A little; 3 = Not at all. To indicate their answer, and to aid their understanding of the Likert scale's meaning, each Likert scale point was accompanied by a picture symbol for the participants to point at (Appendix L). Before the commencement of this part of the process the researcher explained the Likert scale and its three accompanying picture symbols, after which the participants were tested to determine whether they understood the explanation. The three symbols were placed in a row in front of them and they were asked to identify each one. For example, "Which one shows *a little?*" The Likert scale points and their accompanying pictures were understood by 100 % of the participants.

Once the participants demonstrated an understanding of the Likert scale and its picture symbols the second part of the review began. The researcher placed the Likert scale picture symbols in front of the participants and showed them each of the 16 PCS, one at a time. After a participant looked at a PCS the researcher asked him/her to rate the level of representativeness of the PCS. For example, "How much does this picture look like *make the bed*? A lot, a little or not at all?" The researcher recorded the participants' answers. Once all the PCS were rated by the participants they were provided with a token of appreciation (a sweet) and escorted back to class.

The results regarding the PCS were analysed by calculating a total score for each PCS out of a possible score of 18. The scores were allocated according to the Likert point the participants indicated for each PCS (1 = A lot; 2 = A little; 3 = Not at all). All PCS that obtained a total score of nine or more, indicating that they may not be representative of the concepts they depicted, were either adapted or replaced (Appendix M).

A total of nine PCS achieved a score of nine or more, therefore indicating a need for revision. Two PCS and their glosses were changed completely because the PCS could not be successfully altered and appropriate alternative PCS for the glosses could not be found. They were the PCS for 'It looks bad' and 'It's nice and soft' and were replaced by PCS for 'Look at this' and 'It's nice and clean' respectively. These two new PCS were randomly selected from the remaining ones without arrows from Haupt and Alant's (2002) 36 PCS overlay. Two PCS

were modified. The one for 'Help me please' was modified by enlarging the top hand and replacing the lower hand with a child's small hand. The PCS for 'Let's get the bed made' was modified by replacing the stick figure in it with picture of an actual person. Six PCS were replaced with suitable alternative PCS for the same glosses. The PCS for 'Uh oh' was replaced with a face with no highly arched eyebrows. The PCS for 'What a mess' was replaced with a dustbin with rubbish falling out of it. The PCS for 'Let me' was replaced with a boy depicted face-on with one hand up and the other pointing to himself. The PCS for 'Looks good' was replaced with a one depicting a 'thumbs-up' hand gesture, which is culturally more appropriate in the South African context.

Finally, it was decided to replace all Western stick figures represented in the PCS on the overlay with conventional figures. Western stick figures are stereotyped drawings in which the body and limbs are single lines with the arms set obliquely and a triangular skirt often utilised to differentiate female from male drawings (Cox, 1993). Western stick figures are not commonly seen in the drawings of young children (Martlew & Connolly, 1996), indicating that they may not be a relevant form of representation for young children and possibly for individuals with intellectual disability. Conventional figures are realistic drawings of the human figure with distinctions between the head, body and limbs (Cox, 1993). From the age of five to six years children show a greater concern for realism in the depiction of the human figure (Martlew & Connolly, 1996). For these reasons the PCS for 'Need to pull it' and 'We forgot' were also modified by changing the Western stick figures to conventional figures.

Appendix N illustrates the changes made to the PCS and glosses following the peer panel review. It can be seen that three techniques were used to manipulate the PCS following the results of both the panel reviews (Appendices G and N). They are PCS modification in which one or more aspects of the PCS were altered although the resulting PCS remained essentially the same visually, PCS replacement in which the PCS was replaced with another one to represent the same gloss or meaning and PCS removal in which the PCS and its gloss were removed entirely and exchanged for a different gloss and PCS. These three techniques for PCS manipulation are further described with examples in Chapter 5, Section 5.3.4. Appendix O indicates the final 16 PCS and their glosses that were used in the pilot and main studies. Appendix A depicts the 'bed-making' communication overlay used in this study.

3.4.4 The training and trial overlay

A 16 PCS training and trial overlay was used in this study, on which the participants were required to cross one PCS in response to its spoken gloss (Appendix P). This strategy is based on the training procedure in Basson and Alant's (2005) study in which the participants were required to identify a picture that corresponded to a spoken Afrikaans word for eight training items.

The training and trial overlay resembled that of the 16 PCS 'bed-making' overlay in terms of the size and number of PCS. Therefore, 16 PCS were displayed on an A4 page in four rows of four, namely *apple, dog, throw, girl, chair, toilet, shoes, bird, hat, book, baby, cat, man, eat, cry* and *car*. Three of the PCS were used as training items and five as trial items. The glosses for these were, 'Bird', 'Book', 'Throw the ball.', 'Dog', 'The baby is crawling', 'A big chair', 'The cat' and 'Eat your food' respectively. The PCS foils were selected from Fristoe and Lloyd's (1980) list of suggested vocabulary items for an initial sign lexicon for individuals with intellectual disability and other severe communication disorders. Fristoe and Lloyd (1980) developed this list according to guidelines based on typical child language development and ensured that the chosen words were useful or easy to teach or both. They also ensured that their choice of words met the criteria for an initial lexicon as described by Holland (1975), and Lahey and Bloom (1977).

All 16 words that were chosen for use with the training and trial overlay were selected because they were picture producers, culturally relevant to the main participants in the study and unambiguous with regard to each other. In addition, they were not similar to the ones used on the 'bed-making' overlay and their glosses did not contain content words used in the glosses on the 'bed-making' overlay.

3.5 Pilot study (Phase 2)

A pilot study was conducted to ensure the feasibility of the planned participant selection and consent procedures and the planned data collection procedures. It was also conducted to assess the suitability of the test material and protocol (McMillan & Schumacher, 2010). The pilot study is described in terms of participants, objectives, procedures, results and recommendations for the main study.

3.5.1 Participants

The participants for the pilot study were selected from a different, but comparable school for learners with special educational needs (LSEN) to the one used for the main study. Consent was obtained from the school principal and parents of the participants (Appendices Q and R). The parents also completed a biographical information form (Appendix J). Six participants, four girls and two boys, with a mean age of 14;01 (years;months), who met the selection criteria outlined in Section 3.6.1, Table 3.5, took part. Three of them had Setswana as a home language, two Sesotho and one isiZulu. Four of these participants had English as an additional home language. According to information in their school Learner Profiles, three of the participants had a primary diagnosis of spastic diplegic cerebral palsy (CP), one with ataxic cerebral palsy and one with epilepsy. One of the participants did not have a specified diagnosis. All of them had intellectual disabilities. Table 3.3 describes the participants.

Table 3.3

Description of the Pilot Study Participants

Pilot Study Participant	1	2	3	4	5	6
Gender	Female	Female	Female	Male	Male	Female
Age (years;months)	15;00	13;11	13;03	14;00	15;00	13;07
Primary diagnosis	Spastic diplegic CP	Spastic diplegic CP	Learning difficulties	Epilepsy	Not specified	Spastic diplegic CP
Home language	Setswana	Sesotho	isiZulu	Setswana	Sesotho	Setswana
Additional home language	None	English	English	English	None	English
LoLT	English	English	English	English	English	English

Table 3.3 depicts the biographical details of the participants in the pilot study, emphasising their biographical similarity to the participants in the main study.

3.5.2 Objectives, procedures, results and recommendations

Table 3.4 outlines the objectives, procedures, results and recommendations for the pilot study.

Table 3.4

Pilot Study Objectives, Procedures, Results and Recommendations

Objectives	Procedures	Results	Recommendations
To determine whether the distribution to and completion of the letters requesting informed consent from the participants' parents were adequate and effective	The letters requesting informed consent from the parents were given to the participants' class teachers by the researcher to send home with the participants. The teachers collected the reply slips and returned them to the researcher. The researcher monitored the number of responses obtained and whether the reply slips were completed adequately.	The consent forms were distributed and the reply slips returned successfully. However, the consent reply slips were not always completed correctly.	The consent reply slips should be simplified to involve only one of two selections for completion. Either, "I give consent" or "I do not give consent."
To determine whether the participants understood the assent procedure and assent form and were able to complete the assent form	The assent letter was read to each participant. The researcher assisted the participants to complete the form (Section 3.6.4 details the assent procedure). The researcher asked the participants if they understood the letter and the form and their responses on the assent forms were analysed.	All the participants understood the assent procedure and were able to successfully complete the assent form.	Procedure to remain the same for the main study
To determine whether the researcher would be able to manage a group of six participants in a data collection session	The researcher monitored the behaviour of the participants during the pilot session and on the video-recording afterwards.	No difficulties were experienced and the participants participated co-operatively.	Procedure to remain the same for the main study
To determine if the instructions were understandable and audible to the participants in a group of six for the completion of the measuring instrument	Clear instructions were given by the researcher in a scripted format, starting with the training and trial items and then proceeding to the main items (Section 3.6.5 details the procedures for data collection). Before the commencement of the main items the participants were asked if they understood what was required. The researcher analysed the participants' responses on the measuring instruments after completion.	All the participants achieved eight out of eight on the training and trial items indicating understanding of the test procedure. All the participants had marked one PCS per page throughout the measuring instrument, also indicating good understanding of what was required.	Procedure to remain the same for the main study
To determine if the participants were able to cross one PCS per page and turn the pages of the measuring instrument independently	The researcher observed the participants' ability to turn the pages independently. Their crosses on the measuring instrument were observed after the completion of the measuring instruments.	All the participants were able to turn the pages independently and cross one PCS per page efficiently.	Procedure to remain the same for the main study
To determine whether the participants	The researcher analysed the participants' responses	All the participants achieved eight	Procedure to remain the same for the

Objectives	Procedures	Results	Recommendations
were able to cope with the visual scanning demands of 16 PCS on an A4 page	on the measuring instruments after completion.	out of eight on the training and trial items indicating adequate ability to visually scan all the PCS on the pages.	main study
To determine whether the participants were able to concentrate for the duration of the data collection sessions	The pilot sessions were video-recorded. The researcher watched the video recordings and determined whether the participants were listening to and following the instructions for the duration of the sessions.	The duration of the data collection sessions was shorter than anticipated, lasting approximately 25 minutes each. The participants were able to concentrate for the duration of them.	Procedure to remain the same for the main study
To clarify the amount of time needed to complete the assent procedure and the measuring instrument	The assent procedure and measuring instrument administration as described in Sections 3.6.4 and 3.6.5 respectively were timed by the researcher.	Both procedures took shorter than anticipated. The assent procedure took about 10 minutes and the administration of the measuring instrument about 20 minutes.	Inform the participants and their teachers in the main study as to how long the individual testing and the data collection sessions would take.

Table 3.4 shows that there were eight objectives to the pilot study and describes the results of and recommendations from the achievement of these objectives.

3.6 Main study (Phase 3)

The main study is described in terms of the participants, ethical considerations and data collection procedures.

3.6.1 Participant sampling and selection criteria

Purposeful sampling was used as participants represented certain characteristics that were informative to the research (McMillan & Schumacher, 2010), and because a particular LSEN school was identified from which to recruit participants. All learners in the school who met the selection criteria were included. Table 3.5 outlines the criteria that were used for the participant selection process.

Table 3.5

Criteria for Selection of Participants

Criteria	Rationale	Methods
Between the ages of 12;00 – 15;11 (years;months)	The participants needed to be at an age at which they could complete the measuring instrument with its demands pertaining to duration, visual scanning and fine motor skills. They also needed to be able to understand the involved vocabulary and instructions.	As determined by the date of birth on the birth certificates in the participants' Learner Profiles which were made available to the researcher by the school principal
Hearing within normal limits (0 – 25 dB) (Katz, 1996)	Participants needed to be able to hear the instructions and the spoken task items during the data collection sessions.	As determined by hearing test results documented in the participants' Learner Profiles. Also, the trial items of the measuring instrument acted as a hearing screening tool. Participants had to achieve four out of five of the trial items correctly for their results to be included as data.

Criteria	Rationale	Methods
No reports of uncorrected vision	Participants needed to be able to see, discriminate and scan the PCS on the measuring instrument.	Class teachers were asked if they were aware of uncorrected visual problems. Also, the trial items of the measuring instrument acted as a visual screening tool. Participants had to achieve four out of five of the trial items correctly for their results to be included as data.
A home language other than English	The study aimed to investigate the iconicity of PCS to children with EAL.	As determined by the biographical information form to be completed by the parents of the participants.
The ability to independently manipulate pen and paper	The measuring instrument involved the use of pen and paper. Participants needed to be able to cross a PCS and turn the pages of the measuring instrument independently.	As determined by the participants' class teacher.
Attendance at a school for at least three years in which the LoLT was English	The measuring instrument was implemented in English. The participants needed to be able to understand the involved instructions, as well as the spoken vocabulary labels for the PCS.	As determined by information in the participants' Learner Profiles
Presence of a mild intellectual disability, as indicated by a composite IQ score of between 50 and 70 (Kaplan & Sadock, 1998)	The study aimed to investigate the iconicity of PCS to children with EAL and intellectual disability.	As determined by the administration of the Kauffman Brief Intelligence Test – Second Edition (KBIT-2) (Kaufman & Kaufman, 2004)
Correct responses on four out of five of the trial items of the measuring instrument.	The participants needed to demonstrate that they could hear and understand the instructions and test items required to complete the measuring instrument. They also needed to demonstrate that they could see and scan the PCS adequately. The trial items of the measuring instrument acted as a screening tool for these requirements.	After each data collection session the researcher scored the participants' trial items. Data from any participant who achieved less than four out of five on the trial items was excluded.
No direct intervention involving the use of PCS for communication purposes	Previous exposure to and experience with PCS may influence performance on the measuring instrument.	As determined by the participants' therapy records in their Learner Profiles

Table 3.5 shows the nine selection criteria that were set and explains the methods used to ensure that the participants met them.

3.6.2 Participant description

A total of 42 consent letters and forms were distributed. Of those 42, the parents of two potential participants' did not give consent to participate, one consent reply slip was not returned and nine did not meet the IQ selection criteria as determined by the administration of the KBIT-2. Of these nine participants five achieved an IQ score lower than the required selection criterion of between 50 and 70, and four achieved a higher score.

The remaining 30 participants included nine girls and 21 boys with a mean chronological age of 13;04 (years;months). All the participants were being educated in English. IsiZulu was the most commonly spoken home language, followed by Sepedi and Setswana equally, and finally Sesotho and isiXhosa, also equal in frequency. All the participants used at least one additional language at home, with English being the most common one. According to information from their school Learner Profiles, 10 of the participants had a primary diagnosis of intellectual disability, four had right hemiplegic cerebral palsy (CP), four had left hemiplegic CP, one had spastic diplegic CP, one had mixed CP, one had spinal muscular atrophy, one had epilepsy and one had a traumatic brain injury; the remaining seven did not present with any specified primary diagnoses. Despite their primary diagnoses, all the participants had intellectual disabilities. Table 3.6 depicts this biographical information of the 30 participants.

Table 3.6

Biographical Information of the Participants in the Main Study (n=30)

Gender		Age (years;months)		Primary diagnosis		Home language		Additional home language		LoLT	
Male	70%	12;00-12;11	43%	Intellectual disability	33%	isiZulu	74%	English	38%	English	100%
Female	30%	13;00-13;11	20%	None specified	24%	Sepedi	10%	None	33%		
		14;00-14;11	20%	Right hemiplegic CP	14%	Setswana	10%	isiXhosa	13%		
		15;00-15;11	17%	Left hemiplegic CP	14%	Sesotho	3%	Setswana	7%		
				Spastic diplegic CP	3%	isiXhosa	3%	Afrikaans	3%		

Gender	Age (years;months)	Primary diagnosis		Home language	Additional home language		LoLT
		Mixed CP	3%		isiZulu	3%	
		Spinal muscular atrophy	3%		Sesotho	3%	
		Epilepsy	3%				
		Traumatic brain injury	3%				

Table 3.6 depicts the biographical information of the participants in the main study. Table 3.7 shows the distribution of scores obtained by the participants on three standardised tests, namely the KBIT-2 (Kaufman & Kaufman, 2004), Receptive One Word Vocabulary Picture Test (ROWVPT) (Brownell, 2000a) and Expressive One Word Vocabulary Picture Test (EOWVPT) (Brownell, 2000b).

Table 3.7

Score Distribution on Standardised Tests

Test	Type of score	Score	Frequency achieved by participants	Score range
KBIT-2 (Kaufman & Kaufman, 2004)	IQ score for mild intellectual disability (Kaplan & Sadock, 1998)	50 – 54 55 – 60 61 – 65 66 – 69	40 % 34 % 13 % 13 %	50 – 69
ROWPVT (Brownell, 2000a)	Age equivalent score (years;months)	04;09 05;00 – 05;11 06;00 – 06;11 07;00 – 07;11 08;10	3 % 43 % 38 % 13 % 3 %	04;09 – 08;10
EOWPVT (Brownell, 2000b)	Age equivalent score (years;months)	03;07 – 03;11 04;00 – 04;11 05;00 – 05;11 06;00 – 06;11 07;07	17 % 37 % 37 % 6 % 3 %	03;07 – 07;07

Table 3.7 indicates that the majority of participants achieved an IQ score of between 55 and 60 on the KBIT-2 (Kaufman & Kaufman, 2004). The majority of participants achieved an age equivalent English receptive vocabulary score of between 05;00 and 05;11 (years;months) on the ROWPVT (Brownell, 2000a), and an age equivalent English expressive vocabulary score of between 04;00 and 05;11 (years;months) on the EOWVPT (Brownell, 2000b).

3.6.3 Description of the school

The particular school, from which the main participants were recruited, is a South African government LSEN school. It caters for children with a wide range of disabilities and severity of disability, although not for physically disabled learners with normal cognition, or those who can cope academically in a mainstream school environment. The LoLT in the school is English, although the majority of learners attending the school speak another language at home. There are approximately 350 learners attending the school, ranging in age from 3 – 18 years.

Participants for this study were recruited from the Senior Modified phase of the school. This phase caters for learners between the ages of 12;00 and 15;11 (years;months) who do not have the ability to follow the mainstream curriculum. Once the learners reach 16 years of age they can enter the Work Experience Programme, which provides them with training and job preparation for a variety of skill-based occupations such as gardening, hairdressing, beauty treatment, basic computer literacy and waitering.

3.6.4 Ethical considerations

Strict ethical guidelines were followed as proposed by the Research Ethics Committee of the Faculty of Humanities, University of Pretoria and ethical clearance was obtained from this body (Appendix S). Informed consent was obtained from the Gauteng Department of Education (Appendix T), after which the school principal was contacted and consent for the study obtained (Appendix C). Potential participants were identified using information and records obtained from the school's Learner Profiles. Parental consent was obtained for potential participants (Appendix R). Information regarding the potential participants' age, gender, home language and other languages understood and used, years of formal schooling and diagnosed disabilities was obtained from information in their Learner Profiles, as well as from a biographical information form completed by the parents (Appendix J).

Confidentiality was maintained throughout the research process. No names or other identifying information were used on any assent form, KBIT-2 and vocabulary test score sheets or any measuring instruments. Only the participants' respondent numbers appeared on these documents.

Assent is usually obtained from minors nine years and older, as they are old enough to understand that they are volunteering to participate and may choose not to do so without penalty (McMillan & Schumacher, 2010). Assent was obtained from the participants individually before the commencement of the KBIT-2 and vocabulary testing. The participants were asked to assent to the KBIT-2 and vocabulary testing, as well as the group session for completion of the measuring instrument. The assent letters and forms were 'child-friendly' and had the participants' respondent number printed on them (Appendix U).

A scripted routine was used to ensure administration consistency. The researcher read through the assent letter with the participants, allowing time for any questions. The researcher then explained the PCS for 'Yes' and 'No' to be used in the completion of the assent form. Finally, the researcher read each question on the assent form, allowing time for the participants to cross either 'Yes' or 'No' accordingly. The assent procedure lasted about 10 minutes and was video-recorded to familiarise the participants with the presence of the video camera to be used in the main data collection sessions. Once complete, the researcher administered the KBIT-2 and vocabulary testing. Following the completion of these tests the participants received a token of appreciation (a sweet) and were escorted back to class by the researcher.

3.6.5 Procedures for data collection

The data collection procedure was conducted on 30 participants who met the selection criteria (Section 3.6.1, Table 3.5). The measuring instrument was implemented in five sessions on six participants at a time. The six participants in each group were of similar age and, where possible, from the same class to reduce anxiety in the participants. No group contained one child from a different class than the other five. Each session lasted about 20 minutes.

The researcher fetched the assenting participants from their classrooms, provided them with a label with their respondent number and escorted them to the test room. They were seated at a predetermined desk with a measuring instrument, pencil and a 'Stop' card. The cover page of each measuring instrument had the participants' respondent numbers printed on it, indicating at which desk the researcher should place each participant. The desks were spaced widely apart to ensure that participants produced independent results.

Before the implementation of the measuring instrument the researcher explained the purpose of the 'Stop' card, saying that the participants may hold up the card at any time should they

wish to stop participating. Throughout the administration of the measuring instrument a scripted routine was followed to enhance procedural reliability. A training procedure consisting of three items on the training and trial overlay was conducted. Correct completion of the three training items was modelled. The researcher read out the gloss and then demonstrated crossing the target PCS on a measuring instrument held up for the participants to see (Haupt & Alant, 2002). Following this, the participants were required to complete five trial items by crossing the target PCS without a model from the researcher. The participants then completed the measuring instrument involving the 16 'bed-making' overlays. After each data collection session the researcher analysed the responses on the training and trial items. All the participants selected the target PCS 100% of the time, thereby indicating adequate understanding of the task instructions and ability to carry them out correctly. Therefore, all the participants' data was included for analysis.

The order in which the glosses for the PCS were read out was determined prior to the data collection sessions by randomly drawing the PCS out of a bag and assigning a number accordingly (Haupt & Alant, 2002). For the administration of the entire measuring instrument each gloss was repeated once and participants were required to cross one PCS per page (Haupt & Alant, 2002). The participants were instructed to visually scan the PCS on each page before being presented with the spoken gloss (Haupt & Alant, 2002). The researcher prompted the participants to turn the page at the correct time, to ensure that each participant was on the correct page before reading the next gloss. The sessions were video-recorded for procedural reliability. After the measuring instrument had been completed each participant was given a token of appreciation (a sweet) and escorted back to class by the researcher.

3.7 Equipment and material

The equipment and material section first describes the measuring instrument followed by a description of the biographical information form and the two panel review questionnaires developed for use in this study. The three standardised tests used to assess the participants in the pilot and main studies are discussed next and finally, the video recorder, pencils and tokens of appreciation are described.

3.7.1 The measuring instrument

The measuring instrument was composed of eight A4 pages of the training and trial overlay and 16 pages of the 'bed-making' overlay for data collection (Appendices P and A respectively). All pages displayed 16 black and white PCS, presented in four rows of four on an A4 page in portrait orientation. Each PCS was presented in a rectangle five centimetres in length and four centimetres in width. Each measuring instrument included a covering page with the participants' respondent number on it and a final scoring page. Therefore, each measuring instrument contained a total of 26 pages.

3.7.2 The biographical information form

This form consisted of two pages with a total of five questions for the parents of the participants of the peer panel review, pilot study and the main study to complete. The form was the same for the participants of the pilot and main studies. Only the age range options changed on the form for the peer panel review participants (Appendix J).

3.7.3 The questionnaire for the expert panel review

This questionnaire was provided to the participating teachers to complete in their own time. It consisted of nine pages. The first three pages asked nine questions pertaining to their biographical and teaching information. The fourth page provided brief instructions on the completion of the following five pages, as well as the researcher's contact details. On the fifth page the teachers were required to judge the 16 glosses to be used for the PCS on the 'bed-making' overlay. On the last four pages the teachers were required to judge the 16 PCS (Appendix E). The expert panel review was discussed in detail in Section 3.4.2.

3.7.4 The questionnaire for the peer panel review

This questionnaire was administered individually by the researcher to the participants for the peer panel review. It consisted of seven pages. The first four pages required the participants to make a sentence with the main vocabulary used in the 16 glosses for the PCS on the 'bed-making' overlay. The last three pages required the participants to judge the 16 PCS (Appendix K). The peer panel review was discussed in detail in Section 3.4.3.

3.7.5 The KBIT-2

The KBIT-2 is an accepted screening measure of verbal and nonverbal intelligence that is quick and easy to administer (Kaufman & Kaufman, 2004). It yields 3 scores: Verbal,

Nonverbal, and the overall IQ composite score (Kaufman & Kaufman, 2004). The Verbal score is derived from 2 subtests, namely Verbal Knowledge and Riddles which measure word knowledge, general information, verbal concept formation and reasoning ability (Kaufman & Kaufman, 2004). The Nonverbal score is derived from the Matrices subtest which measures problem solving abilities by assessing the ability to perceive relationships and complete visual analogies (Kaufman & Kaufman, 2004). None of the test items require reading and/or spelling skills (Kaufman & Kaufman, 2004).

3.7.6 The ROWPVT and the EOWPVT

The Receptive and Expressive One-Word Picture Vocabulary Tests – Second Editions (Brownell, 2000a; Brownell, 2000b) were administered to each potential participant. The ROWPVT and EOWPVT are individually administered, norm-referenced tests designed for use with individuals aged 02;00 – 18;11 (years;months) (Brownell, 2000a; Brownell, 2000b). The ROWPVT offers a quick and reliable measure of English hearing vocabulary (Brownell, 2000a). The individual is asked to identify an illustration (from a set of four illustrations) that depicts the meaning of a word presented orally by the examiner (Brownell, 2000a). The EOWPVT offers a quick and reliable measure of English speaking vocabulary, which is assessed by asking the individual to name objects, actions and concepts pictured in illustration (Brownell, 2000b).

3.7.7 Video recorder

The pilot study and the main study, as well as their assent procedures were video-recorded using a Canon Mini DV HDV 1080i video-recorder with accompanying tripod stand.

3.7.8 Pencils and tokens of appreciation

Each participant was provided with an HB pencil to use in the completion of the measuring instrument. Each participant in the peer panel review, pilot study and main study received a sweet as a token of appreciation.

3.8 Analysis of data

Descriptive statistics were used to organise and summarise the data obtained in this study (McMillan & Schumacher, 2010). Firstly, a nominal scale of measurement was used for the coding of each PCS used on the ‘bed-making’ overlay (McMillan & Schumacher, 2010).

Each PCS was assigned a number, relating to the order in which it appeared on the 'bed-making' overlay with PCS 1 being in the top left-hand corner of the first row. The numbering continued horizontally across all four rows ending with PCS 16 being the one in the bottom right-hand corner of the last row.

During data collection sessions the participants wore a label with their respondent number which corresponded to the respondent number on their measuring instrument. They selected a PCS in response to a gloss read out by the researcher. Their selections were analysed and recoded as a target PCS if their selected PCS matched its corresponding gloss, or a non-target PCS if it did not. Target selections were awarded 1 point and non-target selections 0 points. These results were captured on the data recording sheet at the back of the measuring instrument after the completion of each data collection session. Results from participants who did not achieve at least four out of five on the trial items of the measuring instrument, would not have been included for data analysis. However, all the participants scored five out of five, therefore all the participants' data was used for analysis.

The data was captured using Microsoft Excel 2003 and analysed using the statistical package, SAS. Descriptive statistics were used. The following computations and analyses were done:

- The frequency with which each target and non-target PCS was selected, was computed. From this data the frequency range of target and non-target PCS selections, as well as the target and non-target PCS selected the most and the least, were determined.
- A comparison between the frequency selections of the target and non-target PCS was made to determine the difference between these two frequencies for each PCS.
- The non-target PCS selections were analysed to determine patterns between non-target PCS selections and their target PCS.
- The frequency with which each of the five word classes represented on the 'bed-making' overlay were selected as target and non-target PCS was computed. From this data the word class selected the most and least as target and non-target PCS was determined. In addition, the word class selected the most overall was determined.
- Spearman correlation coefficients were computed to determine the relationship between the participants' receptive and expressive English vocabulary scores and the frequency of the target PCS they selected (McMillan & Schumacher, 2010).

3.9 Reliability

The data collection sessions were video-recorded to ensure procedural reliability. A second observer (a speech therapist with a Bachelor of Arts degree in Speech and Hearing Therapy) viewed 40% of the data collection sessions using a checklist compiled by the researcher to record whether or not each step in the data collection procedure was completed correctly (McMillan & Schumacher, 2010). Each data collection session had a total of 134 procedural steps and three sessions were checked by the second observer. Procedural reliability is expressed as a percentage (McMillan & Schumacher, 2010).

$$\frac{\text{Number of correctly computed steps} \times 100}{\text{Total number of steps}}$$

= Procedural reliability (%) (McMillan & Schumacher, 2010)

$$\frac{390 \times 100}{420}$$

= 97%

Procedural reliability was high, at 97%, indicating good administration consistency between data collection sessions.

Data reliability was assessed using inter-rater reliability for individual score computations (McMillan & Schumacher, 2010). The scoring of a randomly selected 40% of the data recoding booklets was reviewed by a trained second observer (a speech therapist with a Bachelor of Arts degree in Speech and Hearing therapy) (McMillan & Schumacher, 2010). Inter-rater reliability is expressed as a percentage (McMillan & Schumacher, 2010).

$$\frac{\text{Number of correctly scored items} \times 100}{\text{Number of scored items}}$$

= Inter-rater reliability (%) (McMillan & Schumacher, 2010

$$\frac{286 \times 100}{288}$$

= 99%

The inter-rater reliability score was 99% indicating highly reliable scoring by the researcher.

3.10 Validity

Validity of this study was enhanced by basing the measuring instrument on a published one (Basson & Alant, 2005). Face validity was increased by the use of two panel reviews to determine the appropriateness of the PCS to be used on the measuring instrument, as described in Sections 3.5.3 and 3.5.4.

The internal validity of this study may be affected by the participants' possible exposure to PCS, as some of the learners attending the school from which the sample was recruited used AAC systems involving PCS. This variable was controlled to an extent by the inclusion of a selection criterion pertaining to the use of PCS in the participants' speech and occupational therapy at the school. Experimenter effects on internal validity were reduced by the practice and use of a script for instructions during the administration of the measuring instrument. The small number of participants in this study reduced its external validity, thus limiting the extent to which results may be generalised to populations similar to this study's participants (McMillan & Schumacher, 2010).

3.11 Summary

This chapter outlines the research methodology used in this study. Firstly, the aims of the study are discussed, including the main aim and sub aims. This is followed by a discussion of the research design and the research phases. The main study is discussed in terms of participant selection criteria, general procedures and data collection procedures, and equipment and material. Data analysis is described and finally, reliability and validity issues are discussed.

Chapter 4

Results and Discussion

4.1 Introduction

This chapter presents and discusses the results in accordance with the sub-aims as outlined in Section 3.2.2. Firstly, the response reliability of the participants is discussed after which the frequency of target PCS selections is discussed. Next, the frequency of target PCS selections across the word classes are described, followed by a discussion of the frequency of non-target PCS selections. This discussion is followed by a detailed analysis of the frequently selected non-target PCS selections. Subsequently, the correlation between the participants' English vocabulary scores and their total target PCS selection scores is discussed. Finally, possible influences on the results are outlined.

Two terms are used throughout this chapter to describe and discuss the results, namely 'target PCS' and 'non-target PCS'. A PCS is referred to as a 'target PCS' when it was selected by the participants in response to a gloss intended for it and as a 'non-target PCS' when it was selected in response to a gloss not intended for it.

4.2 Response reliability

The methodology of this study's required the participants to select, in response to a gloss read out by the researcher, one PCS out of 16 possible PCS options depicted on a 'bed-making' communication overlay. A training and trial procedure for the completion of the measuring instrument was conducted before the commencement of the data collection in the main procedure. All the participants achieved 100% in the trial procedure, indicating comprehension of the task instructions and ability to carry them out correctly. None of the participants randomly selected PCS in only one area of the overlay. Neither were any of the participants seen to rush through the completion of the measuring instrument without giving thought to their selections. In addition, there appeared to be logic in the majority of the non-target PCS selections, and only 14.3 % of them could not be explained. There were only two instances of missing data out of a possible 480; these were due to two participants' being unable to decide on a selection, rather than to a lack of attention or them being on the

incorrect page of the measuring instrument. These factors indicate that the participants carefully considered their options before selecting a PCS, which suggests that their response reliability was good and that the results they yielded are a reliable reflection of the representativeness of the 16 PCS used in this study.

4.3 Frequency of target PCS selections

For the purpose of data explanation each PCS was assigned a symbol number according its place on the 'bed-making' communication overlay (Appendix O). Table 4.1 depicts the PCS with their glosses and allocated symbol numbers, as well as the entire body of data from this study. It shows the frequency with which each PCS was selected by the participants as a target and non-target PCS, which target PCS the non-target PCS were selected for and the frequency with which this occurred; and finally it depicts the total frequency with which the participants selected each PCS.

Table 4.1

Entire Body of Data

		PCS and symbol number															
		1 	2 	3 	4 	5 	6 	7 	8 	9 	10 	11 	12 	13 	14 	15 	16 
Symbol number and gloss	1. Put it on	***26***	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*0*	*0*	*1*
	2. Let's get the bed made	*1*	***23***	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*3*
	3. The blanket	*0*	*2*	***18***	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*10*	*0*	*0*	*0*	*0*
	4. They're dirty	*0*	*0*	*0*	***22***	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*7*	*0*	*0*
	5. Look at this	*0*	*0*	*0*	*0*	***20***	*0*	*0*	*1*	*0*	*0*	*1*	*0*	*3*	*1*	*2*	*2*
	6. Help me please	*0*	*1*	*0*	*0*	*0*	***15***	*0*	*3*	*0*	*0*	*1*	*0*	*3*	*0*	*2*	*5*
	7. Need to pull it	*1*	*0*	*0*	*0*	*0*	*0*	***27***	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*
	8. Uh oh	*0*	*0*	*0*	*0*	*0*	*0*	*0*	***25***	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*4*
	9. It's nice and clean	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	***10***	*15*	*2*	*0*	*1*	*0*	*2*	*0*
	10. Put it in the washing basket	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	***26***	*0*	*0*	*0*	*2*	*0*	*0*
	11. Looks good	*0*	*1*	*0*	*0*	*1*	*0*	*0*	*1*	*1*	*0*	***22***	*0*	*0*	*0*	*4*	*0*
	12. The pillow	*1*	*0*	*15*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	***14***	*0*	*0*	*0*	*0*
	13. Let me	*0*	*0*	*0*	*0*	*0*	*2*	*0*	*2*	*0*	*0*	*0*	*0*	***24***	*0*	*0*	*2*
	14. What a mess	*0*	*0*	*0*	*3*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	***26***	*0*	*0*
	15. Hold this please	*0*	*0*	*0*	*0*	*0*	*2*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	***27***	*0*
	16. We forgot	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*15*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	***13***
	Frequency of selection as a target PCS	***26***	***23***	***18***	***22***	***20***	***15***	***27***	***25***	***10***	***26***	***22***	***14***	***24***	***26***	***27***	***13***
	Frequency of selection as a non-target PCS	*3*	*5*	*15*	*6*	*1*	*4*	*1*	*22*	*2*	*16*	*4*	*11*	*9*	*11*	*12*	*18*
	Total selection frequency	*29*	*28*	*33*	*28*	*21*	*20*	*28*	*47*	*12*	*42*	*26*	*25*	*33*	*37*	*39*	*31*

Table 4.1 depicts this study's entire body of data which will be discussed in detail in this chapter. However, this section will only discuss the frequency with which each PCS was selected as a target PCS (i.e. in response to a gloss intended for it) as represented in Table 4.1 in bold.

Figure 4.1 represents the frequency range of the target PCS selections, as well as the PCS selected the most and the least as a target PCS. Each PCS could potentially be selected as a target PCS 30 times (once by each of the 30 participants). The same figure also represents the word class of each PCS. Five word classes were represented in total, namely nouns, verbs, prepositions, descriptors (adjectives and adverbs), and social words (pronouns, wh-question words, exclamations and negative words) (Goosens, Crain, & Elder, 1992). They have been colour-coded according to their word class as described by Goosens et al. (1992) with nouns in yellow, verbs in pink, prepositions in green, descriptors in blue and social words in orange. The key concept of each gloss was used to determine the word class of the PCS.

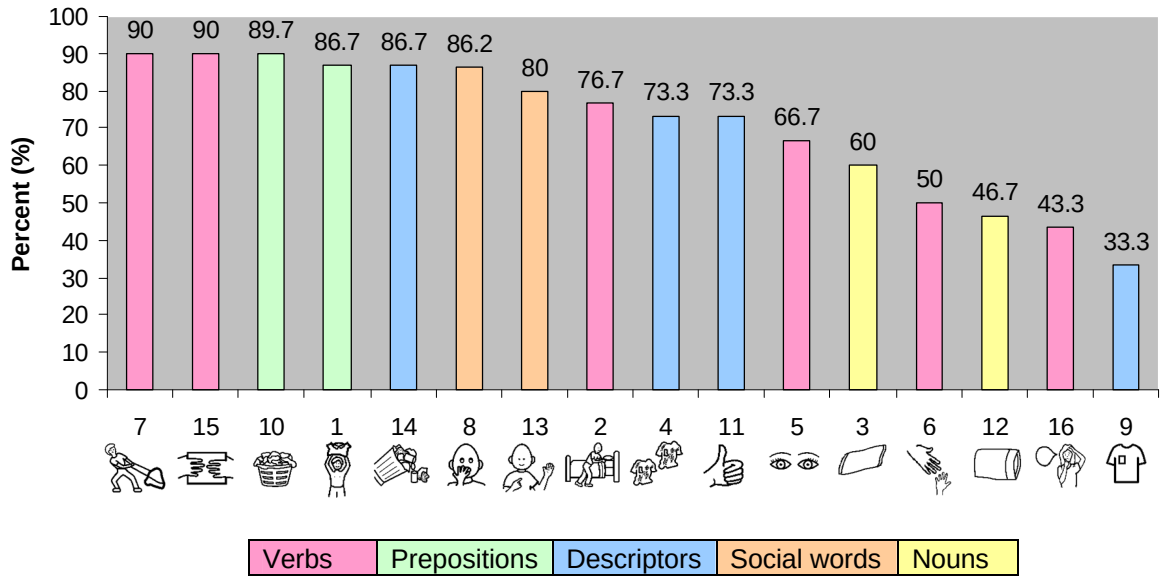

Figure 4.1. The selection frequency of target PCS (n=30). This figure represents the frequency with which each PCS was selected as a target PCS.

Figure 4.1 indicates that 90% of the participants identified PCS 7 [ ] ('Need to pull it') and PCS 15 [ ] ('Hold this please') as target PCS. PCS 10 [ ] ('Put it in the washing

basket') followed with 89.7%. PCS 1 [] ('Put it on') and PCS 14 [] ('What a mess') were next, both with 86.7%. PCS 8 [] ('Uh oh'), PCS 13 [] ('Let me') and PCS 2 [] ('Let's get the bed made') achieved the next highest selection frequencies at 86.2%, 80% and 76.7% respectively. These were followed by PCS 4 [] ('They're dirty') and PCS 11 [] ('Looks good'), both with 73.3%. Next were PCS 5 [] ('Look at this') and PCS 3 [] ('The blanket') with selection frequencies of 66.7% and 60% respectively. The last four PCS, achieving frequencies of 50% and lower, were PCS 6 [] ('Help me please') with 50%, PCS 12 [] ('The pillow') with 46.7%, PCS 16 [] ('We forgot') with 43.3 % and PCS 9 [] ('It's nice and clean') with 33.3 %. These findings indicate that the participants regarded PCS 7, 10 and 15 as the most iconic, while PCS 9 was the least iconic.

Generally, the frequency with which the PCS were selected as target PCS was high. Only three symbols, PCS 12 [] **(**'The pillow'), PCS 16 [] ('We forgot') and PCS 9 [] ('It's nice and clean'), yielded relatively low frequency rates of less than 50%. This suggests that, overall, the PCS used on the 'bed-making' overlay appeared relatively iconic to the participants. This result differs from those of previous PCS iconicity studies using South African participants which indicated that PCS were, in fact, low in iconicity for their participants (Basson & Alant, 2005; Haupt & Alant, 2002). Both these studies used iconicity criteria to analyse their results. Haupt and Alant (2002) used strict (frequency selection of target PCS • 75 %) and lenient (frequency selection of target PCS • 50 %) criteria, which indicated that 2.8% (using strict criteria) or 11.1% (using lenient criteria) of the 36 PCS they used were shown to be iconic for their rural, isiZulu speaking participants. Basson and Alant (2005) used only the lenient criterion with their Afrikaans-speaking participants, which indicated that 25% of the 16 PCS they used were iconic for their experimental group and 31.25 % iconic for their control group. The current study does not quantify iconicity scores as such; however, the results from this study as depicted in Figure 4.1 indicate that the majority of the 16 PCS used in this study appeared to be relatively iconic to the participants with EAL and intellectual disabilities.

The reason for this unexpected finding is likely to be a result of the two panel reviews that were conducted on the initially selected PCS and their glosses. On the basis of the results of these panel reviews all the PCS were modified to ensure their linguistic and cultural appropriateness for this study's participants. Some of the PCS were changed entirely, some were modified, and five of the glosses were changed. (A detailed description and depiction of these changes are presented in Sections 3.4.2 and 3.4.3 and in Appendices G and N.)

These findings indicate that PCS have the potential to be iconic to South African learners with EAL and intellectual disabilities. A high degree of iconicity can be achieved by paying careful consideration to the linguistic status and cultural background of the learners. Haupt and Alant (2002) and Basson and Alant (2005) indicated that both their isiZulu speaking and Afrikaans speaking participants experienced difficulty in interpreting the meaning of the use of arrows in the PCS. This study deliberately did not use PCS containing arrows. By paying attention to factors such as these more relevant PCS can be selected and appropriate modifications made to existing PCS and their glosses to ensure that the resulting symbols are optimally meaningful to their users. Section 5.3 in Chapter 5 summarises the clinical implications of these results.

4.4 Frequency of target PCS selections across word classes

Another unexpected finding from this study concerns the frequency with which the word classes represented on the 'bed-making' overlay were selected as target PCS. Inferential statistics could not be used to compare the selection frequency between the word classes due to an uneven distribution of PCS between them; therefore, a descriptive discussion of the results is presented, based on the data illustrated in Figure 4.1 in Section 4.3.

In Figure 4.1 it is interesting to note that nouns fall in the lower range of the frequency selection of target PCS, indicating that they were less iconic to the participants than most of the other PCS. Three of the word classes, i.e. prepositions, social words and nouns, show equal representation with two PCS in each class. Table 4.2 compares the frequency with which each PCS in these three word classes was selected as a target PCS.

Table 4.2

The Frequency of Target PCS Selections across Prepositions, Social Words and Nouns

Word Class	Symbol number	Gloss	PCS	Frequency selected
Prepositions	10	Put it in the washing basket		89. 7 % (n = 26)
	1	Put it on		86.7 % (n = 26)
Social Words	8	Uh oh		86.2 % (n = 25)
	13	Let me		80 % (n = 24)
Nouns	3	The blanket		60 % (n = 18)
	12	The pillow		46.7 % (n = 14)

Table 4.2 shows that, out of the three word classes, prepositions were selected as target PCS more frequently than social words and nouns, and that nouns were the least frequently selected as target PCS. PCS 10 [] ('Put it in the washing basket') and PCS 1 [] ('Put it on') representing prepositions were selected as target PCS by 89.7% and 86.7% of the participants respectively. PCS 8 [] ('Uh oh') and PCS 13 [] ('Let me') representing social words, were next with 86.2% and 80% respectively. PCS 3 [] ('The blanket') and PCS 12 [] ('The pillow'), representing nouns, were selected as target PCS by 60% and 46.6% of the participants respectively. These results suggest that prepositions were more iconic than social words and nouns, and that nouns were the least iconic of the three word classes.

These findings were not expected. As discussed earlier in the literature review in Section 2.4, there appears to be a consensus that nouns generally tend to be more iconic than other word classes because they more readily lend themselves to graphic representation (Bloomberg et al., 1990; Haupt & Alant, 2002; Mizuko, 1987; Mizuko & Reichle, 1989; Schlosser & Sigafoos, 2002; Yovetich & Young, 1988). The contradictory finding in this study is likely to

be a result of the lack of perceptual distinctiveness between the two PCS used to represent the nouns 'pillow' and 'blanket', namely PCS 12 [ ] and PCS 3 [ ] respectively. These two PCS look very similar and it is easy to understand why they confused participants in this study, thereby reducing their iconicity. This finding is further discussed in Section 4.6. Furthermore, as previously discussed in Section 2.6, nouns are likely to be more sensitive to cultural differences than other word classes (Nigam, 2003), thereby possibly contributing to their reduced iconicity in this study.

4.5 Frequency of non-target PCS selections

The PCS that participants selected in response to a gloss not intended for it, are referred to as 'non-target PCS' and their selection frequency is depicted in Table 4.1 in Section 4.3. Figure 4.2 presents a visual representation of the data pertaining to non-target PCS.

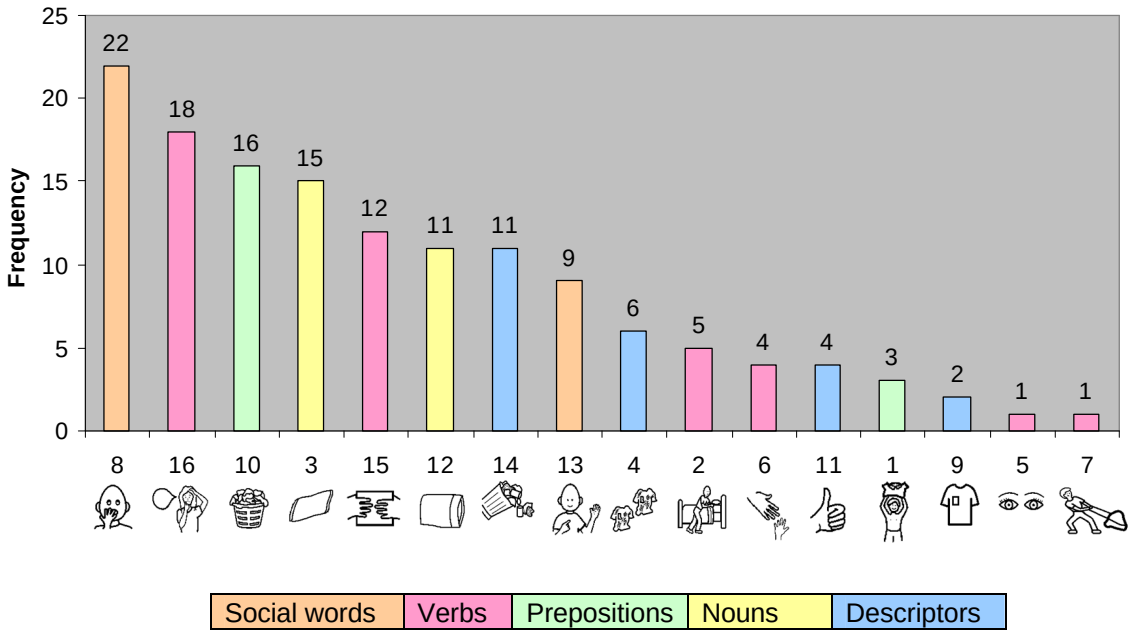

Figure 4.2. The selection frequency of non-target PCS. This figure represents the frequency with which each PCS was selected as a non-target PCS.

Figure 4.2 shows that PCS 8 [ ] ('Uh oh') was selected most frequently (22 times) as a non-target PCS. Next were PCS 16 [ ] ('We forgot') at 18 times, PCS 10 [ ] ('Put it in the

washing basket') at 16 times, PCS 3 [] ('The blanket') at 15 times and PCS 15 [] ('Hold this please') at 12 times. PCS 12 [] ('The pillow') and PCS 14 [] ('What a mess') followed, both being selected as non-target PCS 11 times. Following these were PCS 13 [] ('Let me'), PCS 4 [] ('They're dirty) and PCS 2 [] ('Let's get the bed made') at 9, 6 and 5 times respectively. PCS 6 [] ('Help me please') and PCS 11 [] ('Looks good') followed, both being selected 4 times as non-target PCS. Next were PCS 1 [] ('Put it on') at 3 times and PCS 9 [] ('It's nice and clean') at 2 times. Finally, with the lowest selection frequency as non-target symbols were PCS 5 [] ('Look at this') and PCS 7 [] ('Need to pull it') both being selected once only as a non-target PCS.

Haupt and Alant (2002, p. 44) coined the term 'distinctiveness' to describe 'how well defined or specific were the evoked meanings triggered by a symbol in the mind of the viewer.' It relates to whether viewers perceive similarity to one referent, to many or to none (Haupt & Alant, 2002). They cautioned that 'distinctiveness' should not be confused with 'perceptual distinctness' as described by Fuller et al. (1997) which refers to the degree to which the symbols in a group are clearly different from one another (Haupt & Alant, 2002).

In this study distinctiveness relates to how often a PCS was selected as a non-target PCS. In the light of the above, Figure 4.2 indicates that PCS 8 [] ('Uh oh') can be seen as more indistinctive than the others because it was selected most frequently as a non-target PCS. PCS 5 [] ('Look at this') and PCS 7 [] ('Need to pull it') can be seen as more distinctive because each were selected once only as non-target PCS. Clinically, when working with illiterate AAC users and/or frequent communication partners who cannot rely on the gloss for meaning, it may be beneficial to avoid the use of symbols such PCS 8 that are indistinctive, since their meanings may be ambiguous and cause confusion.

It is interesting to note that two symbols were selected relatively frequently as target PCS but rarely as non-target PCS when compared to the other symbols. They were PCS 7 [] ('Need to pull it') and PCS 1 [] ('Put it on'). Therefore, these two symbols appear to be

more iconic and distinctive than the others. Haupt and Alant (2002) hypothesised that PCS following this pattern would be easier to learn for the typically developing isiZulu participants in their study. Therefore, the same is hypothesised for this study's participants with EAL and intellectual disabilities. Clinically, it may be beneficial to use PCS following this pattern for beginner and/or illiterate AAC users, as they may be easier to learn, their meanings may be more readily interpreted and they may be less likely to be confused with other PCS used simultaneously on a communication overlay.

Two symbols were relatively rarely selected as either target or non-target PCS when compared to the other symbols. They were PCS 6 [] ('Help me please') and PCS 9 [] ('It's nice and clean'). Table 4.1 in Section 4.3 shows these two symbols as having the lowest total selection frequency at 20 and 12 times respectively. The participants in this study did not find these two symbols representative of their glosses or other glosses. PCS following this pattern may be difficult for illiterate AAC users to understand and use as they show reduced iconicity.

Four symbols were selected relatively frequently as both target and non-target PCS when compared to the other symbols. They were PCS 8 [] ('Uh oh'), PCS 10 [] ('Put it in the washing basket'), PCS 15 [] ('Hold this please') and PCS 14 [] ('What a mess'). They had the highest total selection frequency as shown in Table 4.1 at 47, 42, 39 and 37 times respectively. Therefore, these symbols appeared to be more iconic, but also more indistinctive than most of the others. The participants in this study found them to be representative of their glosses, as well as of other glosses and more than the other symbols. PCS on communication overlays that follow this pattern may not be suitable for use with illiterate AAC users and/or frequent communication partners as they may be ambiguous and their meanings may consequently be misinterpreted.

PCS 12 [] ('The pillow') was selected relatively rarely as a target PCS, but relatively frequently as a non-target PCS when compared to the other symbols, indicating that it is more indistinctive and therefore less iconic. PCS 16 [] ('We forgot') showed a unique trend in that it was selected more often as a non-target PCS (18 times) than a target PCS (13 times),

indicating that the participants in this study found it to represent other glosses more than its intended gloss. PCS following these two patterns may be a poor choice for use on communication overlays for illiterate AAC users and/or frequent communication partners as their meanings may be unclear and ambiguous.

4.6 Analysis of frequently selected non-target PCS

Figure 4.2 in the Section 4.5 indicates that eight PCS were selected relatively frequently as non-target PCS when compared to the other symbols. They were PCS 8 [ ] ('Uh oh'), PCS 16 [ ] ('We forgot'), PCS 10 [ ] ('Put it in the washing basket'), PCS 3 [ ] ('The blanket'), PCS 15 [ ] ('Hold this please'), PCS 14 [ ] ('What a mess'), PCS 12 [ ] ('The pillow') and PCS 13 [ ] ('Let me'). When analysing instead of which target PCS they were selected, two trends emerged. Either a particular non-target PCS was often selected instead of a particular target PCS or a particular non-target symbol was selected instead of a variety of target symbols. This section depicts these trends in two tables, namely Table 4.3 and Table 4.4 and discusses each table in detail, starting with Table 4.3.

Table 4.3 illustrates the first trend in which non-target PCS were frequently selected for specific target PCS by the participants and provides a possible explanation for these non-target PCS selections.

Table 4.3

Non-Target PCS Frequently Selected Instead of Specific Target PCS

Frequently selected non-target symbol number	Frequently selected non-target PCS	Target symbol number	Target gloss	Target PCS	Percentage non-target PCS selected	Possible explanation
3		12	The pillow		50 % (n = 15)	Perceptually indistinctive
10		9	It's nice and clean		50 % (n = 15)	Semantically indistinctive

Frequently selected non-target symbol number	Frequently selected non-target PCS	Target symbol number	Target gloss	Target PCS	Percentage non-target PCS selected	Possible explanation
8		16	We forgot		50 % (n = 15)	Perceptually and semantically indistinctive
12		3	The blanket		33.3 % (n = 10)	Perceptually indistinctive
14		4	They're dirty		23.3 % (n = 7)	Semantically indistinctive

Table 4.3 shows that five non-target PCS were frequently selected instead of specific target PCS. It also provides a possible explanation as to why the non-target PCS were selected. In their explanation of the term 'distinctiveness', Haupt and Alant (2002, p. 44) state that it 'relates to the specificity of visual similarity perceived.' The findings of this study depicted in Table 4.3 and Table 4.4 suggest that 'distinctiveness' relates not only to visual similarity, but to semantic/conceptual similarities between PCS as well. Although some PCS may look different, they may have the potential to represent the same concept (e.g. PCS 4 [] ('They're dirty') and 14 [] ('What a mess') may both represent 'dirty', making them interchangeable for some viewers despite their visual dissimilarity.

Table 4.3 suggests three possible influences on distinctiveness: perceptual indistinctiveness, semantic indistinctiveness and both perceptual and semantic indistinctiveness. PCS that are perceptually indistinctive share visual components that make them look similar. PCS that are semantically indistinctive are those that look different visually, but can represent the same gloss/meaning. PCS that are both perceptually and semantically indistinctive share similar visual components and have the potential to represent the same meaning/gloss. These three influences on distinctiveness can affect iconicity and occur when PCS are used simultaneously on a communication overlay as in this study, which is the context in which the PCS are used. Section 5.4 in the following chapter identifies them as contextual effects on the iconicity of graphic symbols. The following discussion of the results in Table 4.3 emphasises these contextual effects and, in some cases of the PCS that are semantically indistinctive, makes reference to the other possible effects (as outlined in Section 2.2, Figure 2.1) that influenced the iconicity of these PCS.

PCS 3 [] ('The blanket') and PCS 12 [] ('The pillow') are visually similar. They are perceptually indistinctive. PCS 3 was selected instead of target PCS 12 by 50% of the participants. PCS 12 was selected instead of target PCS 3 by 33.3% of them. It is likely that the PCS 3 and PCS 12 may have achieved higher target PCS frequency scores and lower non-target PCS scores if only one of them had been used on the overlay, thereby eliminating the ambiguity between them. Contextual effects, as discussed in Section 5.4, may have reduced their iconicity.

PCS 10 [] ('Put it in the washing basket') was selected instead of target PCS 9 [] ('It's nice and clean') by 50% of the participants. The PCS for 'clean' is a white T-shirt []. However, it appears that this symbol is more representative of the concept 'clean' to the participants in this study, perhaps because they have assumed that the PCS 10 depicts a washing basket full of clean clothes newly washed or dry and just taken off the washing line. The washing basket depicted in PCS 10 is frequently used in South Africa when doing laundry, and therefore the participants were likely to be familiar with it. It is likely that this cultural individual effect, as discussed in Section 2.6, influenced the iconicity of PCS 10 and PCS 9. Both these PCS could have represented the concept 'clean' for this study's participants, making them semantically indistinctive. It is possible that PCS 9 would have achieved a higher frequency score as a target PCS, therefore being more iconic, if PCS 10 had not been used on the 'bed-making' overlay simultaneously emphasising the role of contextual effects on the iconicity of graphic symbols as discussed in Section 5.4. The iconicity of PCS 4 [] ('They're dirty') and PCS 14 [] ('What a mess') may also have been influenced by contextual effects. These two PCS are also semantically indistinctive, since both of them can represent the concept 'dirty'. PCS 14 was selected instead of target PCS 4 by 23.3% of the participants. PCS 4 may have been more iconic to the participants had PCS 14 not been used on the 'bed-making' overlay as well.

Contextual effects may have played a role again in the case of PCS 16 [] ('We forgot') and PCS 8 [] ('Uh oh'). They are perceptually indistinctive in that both depict similar facial expressions and hand gestures and they are semantically indistinctive in that they both could be used to depict 'forgot'. PCS 8 was selected instead of target PCS 16 by 50% of the

participants. It is likely that these types of PCS, both perceptually and semantically indistinctive, will be easily confused with one another if used simultaneously on a communication overlay. Clinicians and educators should avoid using these types of PCS simultaneously, especially if the AAC user and/or frequent communication partners are illiterate.

PCS 16 [] ('We forgot'), PCS 15 [] ('Hold this please') and PCS 13 [] ('Let me)' were also often selected as non-target PCS. However, they followed the second observed trend as they were selected instead of a number of target PCS as opposed to just a particular one. Table 4.4 depicts this trend and shows the target PCS that non-target PCS 15, PCS 16 and PCS 13 were selected instead of, the frequency with which this occurred and it also provides a possible explanation for these non-target PCS selections.

Table 4.4

Non-Target PCS Frequently Selected Instead of Various Target PCS

Frequently selected non-target symbol number	Non-target PCS	Target symbol number	Target gloss	Target PCS	Percentage non-target PCS was selected	Possible explanation
16		6	Help me please		16.7% (n = 5)	Semantically indistinctive
		8	Uh oh		13.8% (n = 4)	Perceptually and semantically indistinctive
		2	Let's get the bed made		10% (n = 3)	Uncertain
		5	Look at this		6.7% (n = 2)	Uncertain
		13	Let me		6.7% (n = 2)	Perceptually indistinctive
		7	Need to pull it		3.3% (n = 1)	Uncertain
		1	Put it on		3.3% (n = 1)	Uncertain

Frequently selected non-target symbol number	Non-target PCS	Target symbol number	Target gloss	Target PCS	Percentage non-target PCS was selected	Possible explanation
15		11	Looks good		13.3% (n = 4)	Semantically indistinctive
		9	It's nice and clean		6.7% (n = 2)	Semantically indistinctive
		6	Help me please		6.7% (n = 2)	Semantically indistinctive
		5	Look at this		6.7% (n = 2)	Semantically indistinctive
		2	Let's get the bed made		3.3% (n = 1)	Uncertain
		7	Need to pull it		3.3% (n = 1)	Semantically indistinctive
13		6	Help me please		10% (n = 3)	Semantically indistinctive
		5	Look at this		10% (n = 3)	Semantically indistinctive
		1	Put it on		3.3% (n = 1)	Uncertain
		9	It's nice and clean		3.3% (n = 1)	Uncertain
		16	We forgot		3.3% (n = 1)	Perceptually indistinctive

Table 4.4 depicts that PCS 16 [] ('We forgot') was selected instead of seven target PCS; PCS 15 [] ('Hold this please') was selected instead of six target PCS; and PCS 13 [] ('Let me') was selected instead of five target PCS. Table 4.4 also provides possible reasons for these selections. As in the discussion of Table 4.3, reference is made to the contextual effects (Section 5.4) and other possible effects (as outlined in Section 2.2, Figure 2.1) that may have influenced the iconicity of these PCS.

PCS 16 [] ('We forgot') was selected most often instead of target PCS 6 [] ('Help me please') by 16.7% of the participants. These two PCS are semantically indistinctive in that both can depict the need for 'help'. PCS 6 does so by illustrating a child's hand reaching out for an adult's hand, whereas PCS 16 does so by depicting a child with hand gestures and a facial expression that indicate confusion, and therefore the need for help. Therefore contextual effects may have reduced the iconicity of PCS 6. In addition the individual effect of age, as discussed in Section 2.6, may have reduced the iconicity of PCS 6. The participants in this study were older children between the ages of 12;00 – 15;11 (years;months). Therefore, they may not have identified with the small child's hand reaching out for help as depicted in PCS 6.

PCS 16 [] ('We forgot') and PCS 8 [] ('Uh oh') are both perceptually and semantically indistinctive, since both show similar facial expressions and hand gestures, and both may represent the expression of dismay ('Uh oh'). PCS 16 was selected instead of target PCS 8 by 13.8% of the participants. PCS 16 and PCS 13 [] ('Let me') are perceptually indistinctive as they both depict similar arm and hand gestures. PCS 16 was selected instead of target PCS 13 by 6.7% of the participants. Contextual effects are likely to have reduced the iconicity of PCS 8 and PCS 13.

PCS 16 [] ('We forgot') also had a relatively high incidence of non-target PCS selections for which the reason for selection was uncertain when compared to the other PCS that were selected as non-target PCS for no apparent reason. PCS 16 was selected for unknown reasons instead of PCS 2 [] ('Let's get the bed made') by 10% of the participants, PCS 5 [] ('Look at this') by 6.7% and PCS 7 [] ('Need to pull it') and PCS 1 [] ('Put it on') both by 3.3% of the participants.

PCS 15 [] ('Hold this please') and PCS 11, 9, 6, 5, and 7 are semantically indistinctive. PCS 15 was selected most frequently instead of target PCS 11 [] ('Looks good') by 13.3% of the participants. They both have the potential to represent the gloss 'Looks good'.

PCS 11 does so with a 'thumbs up' hand gesture, while PCS 15 can be seen to do so by depicting hands holding out something for everyone to look at. Therefore contextual effects may have influenced the iconicity of PCS 11. In addition, the individual effect of schooling, as discussed in Section 2.6, may have reduced the iconicity of PCS 15 for this study's participants who had all attended formal schooling for numerous years. For the participants, PCS 15 could represent a learner showing completed class work to the teacher or perhaps good work to the rest of the class.

PCS 15 [] ('Hold this please') was selected by 6.7% of the participants instead of three target PCS, namely target PCS 9 [] 'It's nice and clean', PCS 6 [] 'Help me please' and PCS 5 [] 'Look at this'. PCS 15 and 9 can both represent the concept 'clean'. PCS 9 does so by showing a clean, white T-shirt, whereas PCS 15 possibly does so by showing two hands holding out a clean, white sheet of paper. PCS 15 and PCS 6 [] 'Help me please' can both signify the need for help. PCS 6 does so by illustrating a child's hand reaching out for an adult's hand, while PCS 15 could be seen to depict a child taking his/her class work to the teacher for help. PCS 15 and PCS 5 [] ('Look at this') can both symbolise the gloss 'Look at this'. PCS 5 does so with two open eyes, while PCS 15 could be seen to do so by showing two hands holding out a piece of paper for someone to look at. The possible influence of the participants' schooling on the iconicity of PCS 5 and PCS 6 is clear. PCS 15 may have been more representative of PCS 5 and PCS 6's glosses ('Look at this' and 'Help me please' respectively) as the participants may have often shown their teachers their class work as depicted in PCS 15. Therefore, for PCS 9, 6 and 5, a combination of contextual effects (Section 5.4) and the individual effect of schooling (Section 2.6), may have reduced their iconicity.

PCS 15 [] ('Hold this please') was selected instead of target PCS 7 [] ('Need to pull it') and PCS 2 [] ('Let's get the bed made') by 3.3% of the participants. PCS 15 and PCS 7 can both symbolise the concept 'pull', rendering them semantically indistinctive. PCS 7 does so by showing a boy pulling a rock with a rope, while PCS 15 could be seen to depict two hands pulling on a piece of paper. Here again the influence of contextual effects on

iconicity is demonstrated. The reason for the selection of non-target PCS 15 instead of target PCS 2 is uncertain.

PCS 13 [] ('Let me') was selected by 10% of the participants instead of both target PCS 6 [] ('Help me please') and PCS 5 [] ('Look at this') possibly due to its semantic similarities to them. Both PCS 13 and PCS 6 can represent ('Help me please') causing them to be semantically indistinctive. PCS 6 does so by illustrating a child's hand reaching out for an adult's hand, while PCS 13 could be seen to do so by depicting a child holding up his/her hand to request the teacher's assistance in class. Here again the influence of the age and schooling of the participants may have played a role in influencing the iconicity of these two PCS. This study's participants were older school going children who may have related more to PCS 13 as a request for help than to PCS 6. Therefore the iconicity of PCS 6 may have been reduced by a combination of contextual effects, as discussed in Section 5.4, and by two individual effects (age and schooling), as discussed in Section 2.6. PCS 13 and PCS 5 can both represent, ('Look at this'). PCS 5 does so by depicting two open eyes while PCS 13 could be seen to do so by depicting a child pointing to him/herself and gaining attention by holding his/her other hand up. Therefore the iconicity of PCS 5 may have been influenced by contextual effects.

PCS 13 [] ('Let me') was selected by 3.3% of the participants instead of PCS 1 [] ('Put it on'), PCS 9 [] ('It's nice and clean') and PCS 16 [] ('We forgot'). The reasons for its selection instead of target PCS 1 and PCS 9 are uncertain; however, it may have been selected instead of target PCS 16 due to perceptual similarities. Both PCS 13 and PCS 9 depict children with similar hand and arm gestures, making them perceptually indistinctive and emphasising the possible influence of contextual effects on iconicity.

These findings indicate that clinicians and educators should choose the PCS to be used on communication overlays with care, particularly when they are to be used by young children or those AAC users who are illiterate and/or who have illiterate frequent communication partners. Often the focus is on selecting PCS for vocabulary that is linguistically different; however, attention should also be paid to contextual effects, such as perceptual and semantic similarities between various PCS to be used simultaneously. In cases of perceptual and

semantic indistinctiveness between PCS, alternate ones should be used to reduce ambiguity for the user. If this is not possible, then it is advised that time be spent emphasising the visual and/or semantic differences between the similar PCS so that the AAC user and/or illiterate frequent communication partners may be alerted to which PCS symbol represents what and why.

The results of this study further indicate that the iconicity of a PCS can be influenced by its surrounding PCS. The perceptual and semantic factors of PCS being used simultaneously on an AAC overlay are likely to affect their iconicity. Perceptual and semantic distinctiveness may increase iconicity, as the PCS become less ambiguous. The opposite may occur if the PCS are perceptually and semantically indistinctive. Therefore, the iconicity of PCS should be considered with reference to the other PCS that it will be used with on a specific communication overlay. These influences are identified as contextual effects in the following chapter in Section 5.4.

These findings emphasise that verbal expressions and concepts can be depicted pictorially in more than one way. Different individuals may identify more meaning with one PCS as opposed to another depicting the same referent, depending on the numerous individual variables that affect iconicity as discussed in Sections 2.6 and 2.7. As Fuller and Lloyd (1997, p. 219) state, ‘Iconicity is in the eye of the beholder’. A summary of the clinical implications of this study’s results is presented in the following chapter in Section 5.3.

4.7 Correlation between vocabulary scores and target PCS selections

Findings from several studies, as discussed earlier in the literature review in Section 2.7, have suggested that there is a relationship between spoken language skills and iconicity (Barton et al., 2006; Mirenda & Locke, 1989; Sevcik & Romski, 1986). In this study the participants’ English receptive and expressive vocabulary were formally assessed before their participation in the completion of the measuring instrument. Therefore, Spearman correlation coefficients were computed between the total number of target PCS selected by each participant and their receptive and expressive vocabulary scores in order to determine if a relationship between the them existed. Table 4.5 illustrates the results.

Table 4.5

Spearman Correlation Coefficients of Target PCS and Vocabulary Scores (n=30)

Vocabulary tests	Total	p-values
Receptive vocabulary	-0.127	p = .502
Expressive vocabulary	-0.015	p = .936

Table 4.5 shows that the p-values for both the vocabulary scores are non-significant (p • .05) indicating no correlation between the total number of target PCS selected by each participant and their vocabulary scores. This implies that the receptive and expressive English vocabulary levels of the participants did not, for them, influence the iconicity of the 16 PCS used on the 'bed-making' overlay. This finding is in contradiction with that of other studies that involved participants with intellectual disabilities (Barton et al., 2006; Mirenda & Locke, 1989; Sevcik & Romski, 1986). Findings from these studies, as discussed earlier in the literature review in Section 2.7, indicated that increased spoken language skills enhanced iconicity.

The reason for the difference in this study's findings regarding the influence of language skills on iconicity may be attributed to three factors. Firstly, the three studies mentioned above involved participants with severe intellectual disabilities with limited spoken language skills, whereas this study only involved participants with mild intellectual disabilities and comparatively adequate spoken language skills. It is hypothesised that the mild severity of the participants' intellectual disability positively influenced the iconicity of the 16 PCS in this study.

The second possible explanation may lie with the two panel reviews conducted on the 16 PCS used in this study described in Sections 3.4.2 and 3.4.3. As discussed earlier (Section 4.3) the panel reviews resulted in all the originally selected PCS being changed to accommodate the specific linguistic and cultural characteristics of this study's participants. These changes are likely to have made the PCS more iconic for the participants despite their reduced English vocabulary levels. This finding indicates that the iconicity of PCS can be manipulated. Some clinical suggestions based on the findings of this study as to how clinicians and educators may enhance the iconicity of PCS are presented in the following chapter in Section 5.3.

Finally, the third reason may be due to the fact that the language scores obtained from this study's participants were English expressive and receptive language scores, with English being an additional language and not the participants' first language. Also, the measuring instrument was implemented in English and not in the participants' first language. Other studies involving participants with intellectual disabilities that indicated that increased spoken language skills enhanced iconicity (Barton et al., 2006; Mirenda & Locke, 1989; Sevcik & Romski, 1986) were conducted in the participants' first language.

4.8 Possible influences on the results

A number of possible influences on the results of this study need mentioning. The first, discussed earlier in Sections 4.3 and 4.7 respectively, was the implementation of the two panel reviews before the administration of the measuring instrument. An expert panel review of the initially selected 16 PCS and their glosses was conducted with six teachers. The aim was to ensure that the PCS were representative of the concepts they depicted, and that the glosses were understandable to the main participants in this study with EAL and intellectual disability. Subsequent to these reviews, adaptations were made to the indicated PCS and glosses and then a peer panel reviewed the resulting 16 PCS and their glosses. Six typically developing children with EAL between the ages of 9;00 and 9:11 (years;months) reviewed the PCS to determine whether the vocabulary in the glosses was understandable and whether the PCS were representative of the concepts they depicted to typically developing children. For a detailed description of the panel reviews and the changes made to the PCS and their glosses please see Sections 3.4.2 and 3.4.3 and Appendices G and N respectively.

The changes made to the PCS and glosses following the panel reviews allowed a higher degree of cultural and linguistic appropriateness for the participants with EAL and intellectual disabilities in this study. This may have increased iconicity for these participants, thus influencing the results. Hence, the iconicity of PCS can be manipulated and enhanced to the benefit of an AAC user if one knows how to accomplish it.

The use of a themed communication overlay may have enhanced the iconicity of the PCS used on it (Haupt & Alant, 2002). However, as PCS are often used in such a manner (being grouped together according to various themes) the influences this had on iconicity are

functionally and socially valid (Haupt and Alant, 2002). In addition, the choice of a 'bed-making' theme may have positively influenced the iconicity of the PCS as this is an age-appropriate activity most likely performed daily. Therefore the participants were likely to be familiar with the process and concepts involved. This contextual effect on the iconicity of graphic symbols is discussed further in the following chapter in Section 5.4.

Another possible factor influencing the results may have been the participants' possible previous exposure to PCS. This factor was controlled for to an extent by the inclusion of a selection criterion stating that the participants were not to have had any direct intervention using PCS for communication purposes (Table 3.5, Section 3.6.1). However, the participants may have had some indirect exposure to PCS. A small number of children with LNFS in the same school as the participants used PCS communication overlays for communication with teachers and other adults. Although participants may have seen them, it is unlikely they would have had direct communication experience with them.

Three individual effects on the iconicity of graphic symbols, as discussed in Section 2.6, namely the age, schooling history and symbol experience of the participants may also have influenced the results. The participants were older children between the ages of 12;00 and 15;11 (years;months) and had been in attendance in a formal schooling system for at least three years. Therefore, they had broader world knowledge and more experience with print, pictures and symbols than younger participants or those without formal schooling may have had. This may have enhanced the iconicity of the PCS for them.

The last possible influences on the results of this study may have been the severity of the participants' intellectual disability and their level of spoken language competence. The participants were classified as having mild intellectual difficulties and all of them had relatively adequate spoken language skills when compared to individuals with LNFS and/or moderate to severe intellectual disabilities. These factors may have increased the iconicity of the PCS for them.

4.9 Summary

In this chapter the results were presented and discussed. The results revealed that overall, the PCS used in this study were relatively iconic to the participants. This finding indicates that iconicity of PCS may be enhanced by modifying them according to the specific characteristics of the AAC user. An analysis of the frequently selected non-target PCS showed that the distinctiveness of a PCS relates not only to its visual similarity with other PCS, but to semantic similarities as well, and that these factors are likely to influence the iconicity of PCS. These findings indicate that the iconicity of a PCS can be influenced by its surrounding PCS used simultaneously on a communication overlay. The results of this study also indicate that nouns were less iconic than prepositions and social words and that no correlation existed between the participants' English vocabulary scores and the total number of target PCS selected by them. Finally, the possible influences on the results of this study were discussed.

Chapter 5
Conclusion and Recommendations

5.1 Introduction

This chapter provides a brief overview of the results. The clinical and theoretical implications of this study are also discussed. A critical evaluation of the study is presented and, finally, recommendations for future research are presented.

5.2 Summary of results

The purpose of this study was to determine the iconicity of 16 PCS for 12 - 15-year-old children with EAL and intellectual disability. A quantitative, non-experimental, descriptive design was used and data was obtained using a themed 'bed-making' communication overlay. Two panel reviews were conducted during the development of this overlay to ensure that it was linguistically and culturally appropriate for the participants in this study. Data obtained from the implementation of the measuring instrument was analysed to:

- Describe the iconicity of the PCS
- Determine the frequency with which the PCS were selected as target and non-target PCS
- Determine the frequency of target PCS selections across the word classes represented on the 'bed-making' overlay
- Analyse the frequently selected non-target PCS selections;
- Determine the correlation between the participants' total selection frequency of target PCS and their English vocabulary scores.

The results indicated that, generally, the frequency with which the PCS were selected as target PCS was high. This finding indicated that overall the 16 PCS used on the 'bed-making' overlay appeared relatively iconic to the participants. It is likely that this unexpected finding was partly due to the changes made to the original 16 PCS and glosses selected for use on the overlay based on the findings from the two panel reviews. This suggests that PCS may potentially be iconic to South African learners with EAL and intellectual disabilities, and that their iconicity may be enhanced by modifying them according to the specific characteristics of the AAC user and context. The results also indicated that nouns were less iconic than

prepositions and social words. This second unexpected finding is likely to be a result of the lack of perceptual distinctiveness between the two PCS used to represent the nouns in this study, namely PCS 12 [] ('The pillow') and PCS 3 [] ('The blanket'), which reduced their iconicity. It may also be attributed to nouns possibly being more culturally sensitive than other word classes (Nigam, 2003) as discussed previously in Section 2.6.

Regarding the frequency of the non-target PCS selections, the results showed that PCS 8 [] ('Uh oh') was selected most often as a non-target symbol rendering it more indistinctive than the other symbols to the participants this study. PCS 5 [] ('Look at this') and PCS 7 [] ('Need to pull it') were selected the least, indicating that they were more distinctive than the other symbols. The results regarding the frequency of the non-target PCS selections also indicated that some PCS were selected relatively frequently as target PCS but rarely as non-target PCS when compared to the other symbols, indicating that they were more iconic and distinctive to the participants than the other symbols. Clinically, PCS following this pattern may be more beneficial to use on communication overlays for illiterate AAC users and/or frequent communication partners. Other PCS followed patterns indicating that their meanings may be ambiguous and/or unclear, thereby making them less effective communication symbols. These three patterns were PCS that were selected relatively rarely as both target and non-target PCS, PCS that were selected relatively frequently as both target and non-target PCS and PCS that were selected relatively rarely as target PCS but frequently as non-target PCS. The use of PCS following these three patterns may cause confusion for illiterate AAC users and/or frequent communication partners.

An analysis of the eight PCS frequently selected as non-target PCS revealed two trends: Either a particular non-target PCS was often selected instead of a particular target PCS or a particular non-target PCS was selected for a variety of target PCS, as opposed to only a specific one. An analysis of these two trends indicated that the distinctiveness of a PCS can influence it iconicity and also the iconicity of those surrounding it. It also indicated that distinctiveness relates not only to visual similarity between symbols, but also to semantic/conceptual similarities between them as well. This study tentatively suggests that three possible influences on the distinctiveness of a PCS exist, namely perceptual distinctiveness, semantic distinctiveness and both perceptual and semantic distinctiveness

(Section 4.6). The conclusion of these findings was that the iconicity of a PCS can be influenced by its surrounding PCS and that the perceptual and semantic factors of PCS being used simultaneously on an AAC overlay are likely to affect their iconicity.

Finally, the results of this study indicated no correlation between the total number of target PCS selected by each participant and their English vocabulary scores. This finding was also unexpected. It was probably due to the mild severity of the participants' intellectual disabilities, as well as the changes made to the PCS following the two panel reviews, both of which may have increased the iconicity of the PCS for the participants in this study. Based on the results of this study some clinical suggestions for the enhancement of the iconicity of PCS are made in the following Section 5.3.

5.3 Clinical implications – suggestions for the enhancement of the iconicity of PCS

The following clinical suggestions for the enhancement of the iconicity of PCS are discussed with reference to the results of this study only, as described in Chapter 4. Other influences on iconicity are discussed in Chapter 2. In addition, the following suggestions apply mainly to AAC users who are illiterate and/or who have illiterate frequent communication partners who would be unable to rely on the gloss for meaning.

5.3.1 General considerations

- The iconicity of PCS to be used simultaneously on a communication overlay, particularly on a theme-based overlay, should be considered in relation to one another, as the iconicity of a PCS may be influenced by those surrounding it. When doing so, particular attention should be paid to the perceptual and semantic distinctiveness between them.
- It is important to be aware of the various individual effects that can influence iconicity as discussed in Sections 2.6 and 2.7, since they appear to have an influence on the semantic distinctiveness between PCS.

5.3.2 PCS to use

- PCS that are iconic may be more meaningful to the AAC user and his/her communication partner/s.

- PCS that are both more iconic and distinctive in relation to the PCS they will be used with, may be more effective communication symbols because they will reduce ambiguity and may be more easily learned (Haupt & Alant, 2002). In the current study, PCS 7 [] ('Need to pull it') and PCS 1 [] ('Put it on') followed this pattern.
- PCS that are perceptually and semantically distinctive from one another will aid in reducing ambiguity, thereby enhancing iconicity when used simultaneously on a communication overlay.

5.3.3 PCS to avoid

- PCS that are less iconic may be less meaningful to the AAC user and his/her communication partner/s.
- PCS that are indistinctive may be ambiguous.
- PCS that seem both more indistinctive and therefore less iconic in relation to other PCS they will be used with may not be effective communication symbols. PCS 16 [] ('We forgot') in this study followed this pattern.
- PCS that are very perceptually indistinctive may cause difficulties for an AAC user with visual difficulties. It is likely that many AAC users may have a compromised visual system (Mineo Mollica, 2003), making perceptually indistinctive symbols difficult to distinguish.
- PCS that are both perceptually and semantically indistinctive to other PCS they will be used with on a communication overlay are likely to increase ambiguity, thereby reducing their iconicity.

5.3.4 PCS manipulation

At times it may be difficult to find appropriate PCS or to avoid ambiguous ones. In these cases the PCS can be changed or manipulated to enhance iconicity. Three techniques for doing this were used in this study as discussed towards the end of Section 3.4.3 and are suggested here.

- *PCS modification* can be conducted in which one or more aspects of the PCS are altered without changing the overall appearance of the resulting PCS. For example, in this study the PCS representing 'Help me please' was adjusted from this [] with two same-sized

hands to this [], with the lower had made smaller to indicate a child's hand since the participants in this study were children. Further examples of PCS modification are when PCS involving Western stick figures are exchanged for the same symbol involving convention figures. For example, in this study the PCS representing 'Let's get the bed made' was adjusted from this [] with a Western stick figure to this [] with a conventional figure. Although this study did not involve colour, colour manipulations/changes to a PCS may be another example of PCS modification.

- *PCS replacement* can be conducted in which a PCS may be replaced with another one to represent the same gloss or meaning. For example, in this study the PCS representing 'Looks good.' was changed from this [] to the more appropriate one for the South African culture, i.e. []. Another example from this study is the manipulation of PCS [] ('Put it in the hamper') to PCS [] ('Put it in the washing basket'). Although the vocabulary in the gloss changed, the meaning of the gloss remained the same making this manipulation a PCS replacement as opposed to a PCS removal.

- *PCS removal* can be conducted in which a PCS and its gloss are removed entirely from the communication overlay and exchanged for a different PCS, gloss and meaning. As this manipulation will result in the entire loss of the symbol's intended meaning, this change should only be made if PCS modification or replacement is not possible, and if the symbol is interfering with effective communication. For example, in this study no PCS modification or replacement seemed to enhance the iconicity of PCS [] ('It's nice and soft'). It was therefore removed and replaced with PCS [] ('It's nice and clean').

By following these suggestions it may be possible to enhance the iconicity of PCS to be used on a communication overlay for a specific AAC user.

5.4 Theoretical implications

Chapter 2 provided the theoretical background for this study within the framework of the various influences on the iconicity of graphic symbols. Four groups of effects drawn from the pertaining literature were discussed in detail, namely symbol, referent, instructional and individual effects and Figure 2.1 was designed to provide a visual representation of these effects.

The results of this study indicated that the iconicity of PCS can be influenced by the context in which they are presented. PCS used simultaneously on a communication overlay can influence one another's iconicity depending on their distinctiveness. Perceptual and semantic indistinctiveness, as discussed in Section 4.6, may act to increase ambiguity in their meaning, thereby reducing their iconicity. In addition, Haupt and Alant (2002) indicated that the use of PCS within the context of a themed overlay may influence their iconicity since all the symbols will be semantically related. Therefore, this study proposes a fifth group of effects that may influence the iconicity of graphic symbols, namely contextual effects. Figure 5.1 shows the addition of this group to the already existing four, as previously depicted in Figure 2.1.

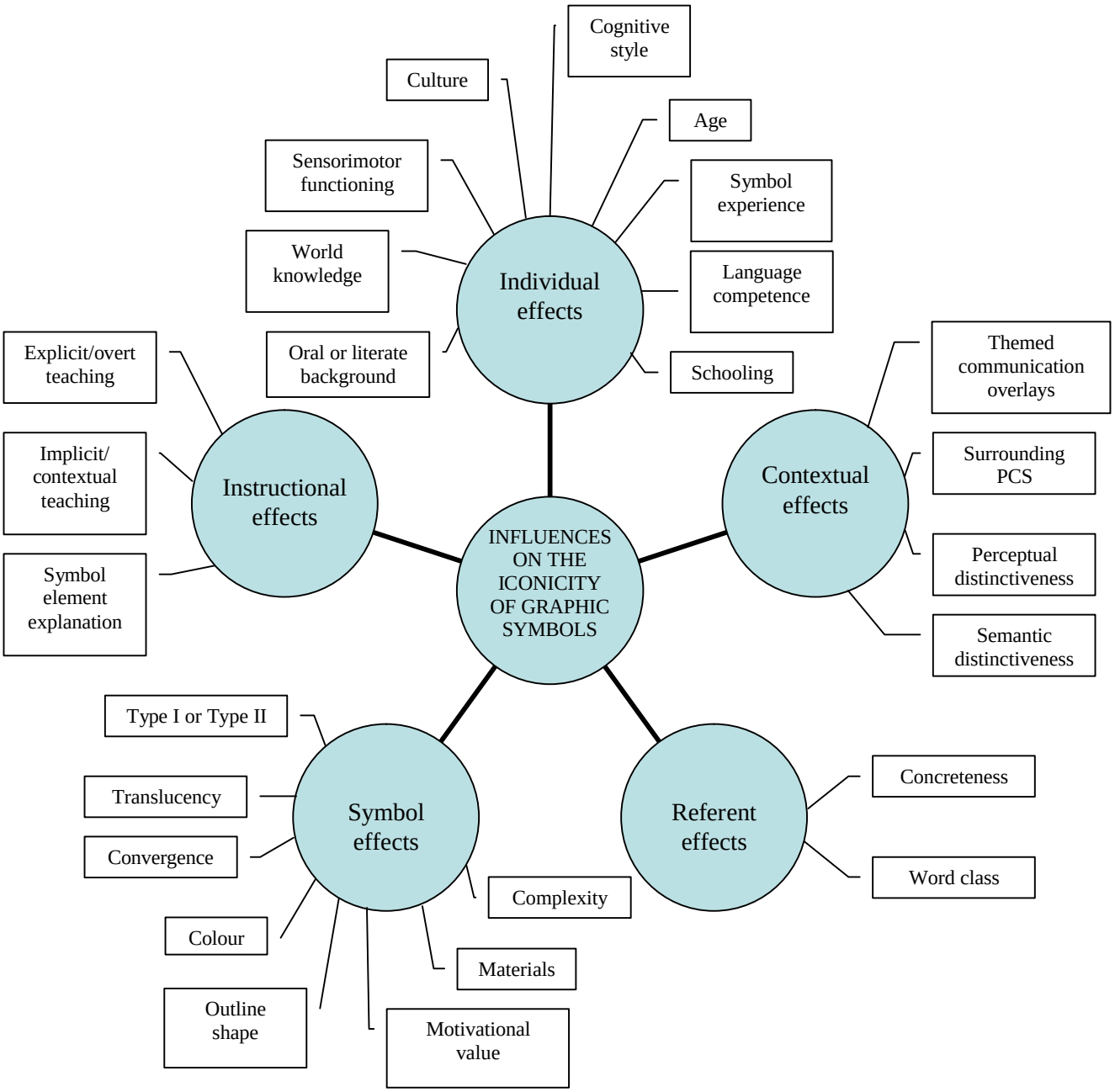

Figure 5.1. Influences on the iconicity of graphic symbols, including contextual effects. This figure illustrates the various influences on the iconicity of graphic symbols as discussed in Chapter 2 with the addition of a fifth group of effects, namely contextual effects.

5.5 Critical evaluation

This study took the first step towards obtaining information regarding iconicity for individuals with disabilities in South Africa. Previous iconicity studies undertaken in South Africa have involved typically developing children and adults without intellectual disabilities. It also took

a preliminary look at the ways in which PCS used simultaneously on a communication overlay influence one another's iconicity, as well as taking an initial step at providing some clinical guidelines as to how the iconicity of PCS can be enhanced.

The validity of the methodology and measuring instrument used in this study was enhanced by basing it on the methodologies used in two previous South African iconicity studies (Basson & Alant, 2005; Haupt & Alant, 2002) and by conducting a rigorous pilot study. The development of the measuring instrument for this study involved the implementation of two panel reviews to ensure that it was culturally and linguistically appropriate for the participants. This also heightened the validity of the measuring instrument. In addition, the measuring instrument involved the use of a themed 'bed-making' communication overlay. In clinical practice communication overlays are often designed around themes, therefore this study's use of such an overlay made it functionally and socially more valid (Haupt & Alant, 2002).

Although the use of a themed overlay in iconicity research has its advantages, it may also limit the generalizability of the findings to the same symbols used in other contexts (Basson & Alant, 2005). Another limitation of this study is the heterogeneity of the participants. Although they all presented with mild intellectual disabilities, the aetiology of the disability differed, as did the primary disabilities and/or medical conditions that some of the participants presented with, for example various classifications and severity of cerebral palsy, epilepsy and spinal muscular atrophy. In addition, the participants' home languages differed, for example isiZulu, isiXhosa and Setswana.

The participants in this study may have had some indirect exposure to PCS that were used on the communication overlays of some of the few children with LNFS in the school they attended. The children using these overlays mainly do so to communicate with teachers and other adults. A final limitation of this study can be seen in the uneven distribution of PCS across the five word classes represented on the 'bed-making' overlay. This prevented the researcher from using inferential statistics to compare the selection frequencies between the word classes.

5.6 Recommendations for future research

The recommendations for future research are:

- The iconicity of PCS for South African populations with disabilities needs to be further investigated. This study used participants with mild intellectual disabilities and functional speech and language skills. A similar study could be undertaken with participants with moderate to severe intellectual disabilities and/or LNFS. In addition, younger participants with disabilities could be included.
- The learnability of PCS for South African individuals with disabilities requires further research. This could include investigating the efficacy of different teaching strategies.
- The results of this study indicated that the iconicity of PCS can be manipulated to enhance their appropriateness for different users by considering contextual effects. It may be worthwhile to investigate the types and effects of such manipulations, as well as their implications. For example, the iconicity of PCS on a communication overlay could be determined on a group of participants before and after manipulations are made and the results compared.
- The results of this study also indicated that the iconicity of a PCS can be influenced by the context in which it is used. Therefore, further research into the effects of perceptual and semantic distinctiveness and the use of themed communication overlays on the iconicity of graphic symbols could be useful.
- There appears to be a variety of ways in which prepositions can be represented in using PCS. It may be useful to investigate these variations to determine which would be more meaningful for individuals with disabilities.
- This study used only black and white PCS. Further research into the effects of colour on iconicity for South African populations with disabilities may be useful.
- This study only involved children with intellectual disabilities. A comparative iconicity study using typically developing children and children with intellectual disabilities may yield useful information, specifically regarding the way in which children with intellectual disabilities relate to PCS and use iconicity to aid in their interpretation.

5.7 Summary

In this chapter the conclusions of this study were presented. A summary of the results and their clinical and theoretical implications were provided. A critical evaluation of this study was discussed and, finally, recommendations for future research were suggested.

REFERENCE LIST

Alant, E., Kolatsis, A., & Lilienfeld, M. (2010). The effect of sequential exposure of color conditions on time and accuracy of graphic symbol location. *Augmentative and Alternative Communication, 26(1),* 41-47.

Blachowicz, C. L. Z. (1994). Problem solving strategies for academic success. In G. P. Wallach & K. G. Butler (Eds.), *Language learning disabilities in school-age children and adolescents: Some principles and applications* (pp. 304-322). New York: Macmillan College Publishing Company.

Barton, A., Sevcik, R. A., & Romski, M. A. (2006). Exploring visual-graphic symbol acquisition by pre-school age children with developmental and language delays. *Augmentative and Alternative Communication, 22(1),* 10-20.

Basson, M., & Alant, E. (2005). The iconicity and ease of learning of picture communication symbols: A study with Afrikaans-speaking children. *The South African Journal of Communication Disorders, 52,* 4-11.

Beukelman, D. R., & Mirenda, P. (1998). *Augmentative and alternative communication: Management of severe communication disorders in children and adults (2nd ed.).* Baltimore: Paul H Brookes.

Beukelman, D. R., & Mirenda, P. (2005). *Augmentative and alternative communication: Supporting children and adults with complex communication needs* (3rd ed.). Baltimore: Paul H Brookes.

Blischak, D. M., Lloyd, L. L., & Fuller, D. R. (1997). Terminology issues. In L. L. Lloyd, D. R. Fuller, & H. H. Arvidson (Eds.), *Augmentative and alternative communication: A handbook of principles and practices* (pp. 43-47). Boston: Allyn and Bacon.

Bloomberg, K., Karlan, G. R., & Lloyd, L. L. (1990). The comparative translucency of initial lexical items represented in five graphic symbol systems and sets. *Journal of Speech and Hearing Research, 33,* 717-725.

Bornman, J., Alant, E., & Du Preez, A. (2009). Translucency and learnability of Blissymbols in Setswana-speaking children: An exploration. *Augmentative and Alternative Communication, 25(4),* 287-298.

Bornman, J., Bryen, D. N., Kershaw, P., & Ledwaba, G. (2011). Reducing the risk of being a victim of crime in South Africa: You can tell and be heard! *Augmentative and Alternative Communication, 27(2),* 117-130.

Brownell, R. (2000a). *The Receptive One-Word Picture Vocabulary Test (2nd ed.).* California: Academic Therapy Publications.

Brownell, R. (2000b). *The Expressive One-Word Picture Vocabulary Test (2nd ed.).* California: Academic Therapy Publications.

Cantwell, D. P., & Baker, L. (1985). Speech and language: Development and Disorders. In M. Rutter & L. Hersov (Eds.), *Child and adolescent psychiatry: Modern approaches (2nd ed.)* (pp. 526-544). Boston: Blackwell Scientific Publications.

Cox, M. (1993). *Children's drawings of the human figure.* Hillsdale, NJ: Erlbaum.

De Klerk, V. (2002). Language issues in our schools: Whose voice counts? Part 1: The parents speak. *Perspectives in Education, 20(1),* 1-14.

DeLoache, J. (1991). Symbolic functioning in very young children: Understanding of pictures and models. *Child Development, 62,* 736-752.

DeLoache, J. (1995). Early understanding and use of symbols: The model model. *Current Directions in Psychological Science, 4,* 109-113.

DeLoache, J., Kolstad, V., & Anderson, K. N. (1991). Physical similarity and young children's understanding of scale models. *Child Development, 62,* 111-126.

DeLoache, J., Peralta de Mendoza, O. A., & Anderson, K. N. (1999). Multiple factors in early symbol use: Instructions, similarity, and age in understanding a symbol-referent relation. *Cognitive Development, 14,* 299-312.

DeLoache, J., & Sharon, T. (2005). Symbols and similarity: you can get too much of a good thing. *Journal of Cognition and Development, 6,* 33-49.

Deregowski, J. B. (1980). Perception. In H. C. Triandes, & W. Lonner (Eds.), *Handbook of cross-cultural psychology: Volume 3, Basic Processes* (pp. 21-115). Boston: Allyn and Bacon.

Du Plessis, S., & Naudé, E. (2003). The needs of teachers in pre-school centres with regard to multilingual learners. *South African Journal of Education, 23(2),* 122-129.

Dixon, L. S. (1981). A functional analysis of photo-matching skills in severely retarded adolescents. *Journal of Applied Behaviour Analysis, 14,* 465-478.

Emms, L., & Gardner, H. (2010). Study of two graphic symbol-teaching methods for individuals with physical disabilities and additional learning difficulties. *Child Language Teaching and Therapy, 26(1),* 4-22.

Erin, J. N. (2002). Students with visual impairments and additional disabilities. In A. J. Koenig, & M. C. Holbrook (Eds.), *Foundations of education: Instructional strategies*

for teaching children and youths with visual impairments (pp. 720-752). New York: AFB Press.

Forney, P. E., & Heller, K. W. (2004). Sensorimotor development: Implications for the educational team. In F. P. Orelove, D. Sobsey, & R. K. Silberman (Eds.), *Educating children with multiple disabilities: A collaborative approach (4th ed.)* (pp. 425-527). Baltimore: Paul H Brookes.

Fristoe, M., & Lloyd, L. L. (1979). Nonspeech communication. In N. R. Ellis (Ed.), *Handbook of Mental Deficiency: Psychological theory and research* (2nd ed.) (pp. 401-430). New York: Lawrence Erlbaum Associates.

Fristoe, M., & Lloyd, L. L. (1980). Planning an initial expressive sign lexicon for persons with severe communication impairment. *Journal of Speech and Hearing Disorders, 45,* 170-180.

Fuller, D. R., & Lloyd, L. L. (1987). A study of physical and semantic characteristics of a graphic symbol system as predictors of perceived complexity. *Augmentative and Alternative Communication, 3(1),* 26-35.

Fuller, D. R., & Lloyd, L. L. (1997). Symbol selection. In L. L. Lloyd, D. R. Fuller, & H. H. Arvidson (Eds.), *Augmentative and Alternative Communication: A handbook of principles and practices* (pp. 43-47). Boston: Allyn and Bacon.

Fuller, D. R., Lloyd, L. L., & Stratton, M. M. (1997). Aided AAC symbols. In L. L. Lloyd, D. R. Fuller, & H. H. Arvidson (Eds.), *Augmentative and alternative communication: A handbook of principles and practices* (pp. 43-47). Boston: Allyn and Bacon.

Goosens, C. A., Crain, S., & Elder, P. (1992). *Engineering the preschool environment for interactive social communication.* Birmingham, AL: Southeast Augmentative Communications Publications.

Goosens, C. A., Crain, S., & Elder, P. (1996). *Communication displays for engineered preschool environments: Book II. Matrix-32 and matrix-36 displays.* Solana Beach, CA: Mayer-Johnson Co.

Hatton, D. D. (2001). Model registry of early childhood visual impairment: First-year results. *Journal of Visual Impairment and Blindness, 95(7),* 418-433.

Haupt, L., & Alant, E. (2002). The iconicity of Picture Communication Symbols for rural Zulu children. *The South African Journal of Communication Disorders, 49,* 40-49.

Hetzroni, O. E., & Harris, O. L. (1996). Cultural aspects in the development of AAC users. *Augmentative and Alternative Communication, 12(1),* 52-58.

Holland, A. (1975). Language therapy for children: Some thoughts on context and content. *Journal of Speech and Hearing Disorders, 40,* 514-523.

Huang, C. H., & Chen, M. C. (2011). Effect of translucency on transparency and symbol learning for children with and without cerebral palsy. *Research in Developmental Disabilities, 32,* 1829-1836.

Huer, M. B. (1997). Culturally inclusive assessments for children using augmentative and alternative communication (AAC). *Journal of Children's Communication Development, 19(1),* 23-34.

Huer, M. B. (2000). Examining perceptions of graphic symbols across cultures: Preliminary study of the impact of culture/ethnicity. *Augmentative and Alternative Communication, 16(3),* 180-185.

Johnson, R. (1981). *The Picture Communication Symbols.* Solana Beach, CA: Mayer-Johnson.

Kaas, J. H. (2000). Why does the brain have so many visual areas? In M. S. Gazzaniga (Ed.), *Cognitive neuroscience: A reader* (pp. 448-472). Oxford, UK: Blackwell Publishers.

Kaplan, H. I., & Sadock, B. J. (1998). *Synopsis of psychiatry: Behavioural science /Clinical psychiatry (8th ed.).* Baltimore: Lippincott Williams and Wilkins.

Katz, F. A. (1996). Pediatrics. In S. E. Gerber (Ed.), *The handbook of pediatric audiology* (pp. 15-34). Washington: Gallaudet University Press.

Kaufman, A. S., & Kaufman, N. L. (2004). *KBIT-2 - Kaufman Brief Intelligence Test, Second Edition – Manual*. Bloomington: Pearson.

Koekemoer, H. (2000). The comparison of the learnability and recognition between Blissymbolics and Cyberglyphs. *University of Pretoria: Electronic Theses and Dissertations.* etd-05112007-074054.

Lafon, M., & Webb, V. (2008). The standardisation of African languages: Language political realities. (Les Nouveaux Cahiers de l'IFAS) IFAS Working Paper Series, No. 11, August 2008.

Lahey, M., & Bloom, L. (1997). Planning a first lexicon: Which words to teach first. *Journal of Speech and Hearing Disorders, 42,* 340-350.

Light, J. C., Binger, C., & Kelford Smith, A. (1994). Story reading interactions between preschoolers who use AAC and their mothers. *Augmentative and Alternative Communication, 10(4),* 255-268.

Light, J., Drager, K. D R., & Nemser, J. G. (2004). Enhancing the appeal of AAC technologies for young children: Lessons from the toy manufacturers. *Augmentative and Alternative Communication, 20(3),* 137-149.

Light, J., & Lindsay, P. (1991). Cognitive science and augmentative and alternative communication. *Augmentative and Alternative Communication, 7(3),* 186-203.

Light, J., Page, R., Curran, J., & Pitkin, L. (2007). Children's ideas for the design of AAC assistive technologies for young children with complex communication needs. *Augmentative and Alternative Communication, 23(4),* 274-287.

Lloyd, L. L., & Fuller, D. R. (1990). The role of iconicity in augmentative and alternative communication symbol learning. In W. I. Fraser (Ed.), *Key issues in mental retardation issues* (pp. 295-306). London: Routledge.

Lloyd, L. L., Fuller, D. R., & Arvidson, H. H. (1997). Glossary. In L. L. Lloyd, D. R. Fuller, & H. H. Arvidson (Eds.), *Augmentative and alternative communication: A handbook of principles and practices* (pp. 522-543). Boston: Allyn and Bacon.

Lloyd, L. L., Fuller, D. R., Loncke, F., & Bos, H. (1997). Introduction to AAC symbols. In L. L. Lloyd, D. R. Fuller, & H. H. Arvidson, (Eds.), *Augmentative and alternative communication: A handbook of principles and practices* (pp. 43-47). Boston: Allyn and Bacon.

Loncke, F. T., Campbell, J., England, A. M., & Haley, T. (2006). Multimodality: A basis for augmentative and alternative communication – psycholinguistic, cognitive, and clinical/educational aspects. *Disability and Rehabilitation, 28(3),* 169-174.

Luckasson, R., Borthwick-Duffy, S., Buntinx, W. H. E., Coulter, D. L., Craig, E. M., Reeve, A., Schalock, R. L., Snell, M. E., Spitalnik, D. M., Spreat, S., & Tassé, M. J. (2002). *Mental retardation: Definition, classification, and systems of support (10th ed.).* Washington, DC: American Psychological Association.

Luftig, R. L., & Bersani, H. A., Jr. (1985). An investigation of two variables influencing Blissymbol learnability with nonhandicapped adults. *Augmentative and Alternative Communication, 1(1),* 32-37.

Martlew, M., & Connolly, K. J. (1996). Human figure drawings by schooled and unschooled children in Papua New Guinea. *Child Development, 67,* 2743-2762.

McNaughton, S. (1993). Graphic representational systems and literacy learning. *Topics in Language Disorders, 13(2),* 58-75.

McNaughton, S., & Lindsay, P. (1995). Approaching literacy with AAC graphics. *Augmentative and Alternative Communication, 11(4),* 212-228.

McMillan, J., & Schumacher, S. (2010). *Research in education: Evidence-based inquiry* (7th ed.). Boston: Pearson.

Meirim, G., Jordaan, H., Kallenbach, A., & Rijhumal, M. (2010). Development of semantic processes for academic language in foundation phase EAL learners. *South African Journal of Communication Disorders, 57,* 43-50.

Mineo Mollica, B. (2003). Representational Competence. In J. C. Light, D. R. Beukelman, & J. Reichle (Eds.), *Communicative competence for individuals who use AAC* (pp. 107-146). Baltimore: Paul H. Brookes.

Mirenda, P., & Locke, P. A. (1989). A comparison of symbol transparency in nonspeaking persons with intellectual disabilities. *Journal of Speech and Hearing Disorders, 54,* 131-140.

Mizuko, M. (1987). Transparency and ease of learning of symbols represented by Blissymbols, PCS, and Picsyms. *Augmentative and Alternative Communication, 3(3),* 129-136.

Mizuko, M., & Reichle, J. (1989). Transparency and recall of symbols among intellectually handicapped adults. *Journal of Speech and Hearing Disorders, 54,* 627-633.

Moolman, E., & Alant, E. (1997). The teaching of Blissymbols as a bridge into literacy for children with cognitive impairments: A comparison of two training approaches. *The South African Journal of Communication Disorders, 44,* 73-84.

Musselwhite, C. R., & Ruscello, D. M. (1984). Transparency of three communication symbol systems. *Journal of Speech and Hearing Research, 27,* 436-443.

Nadal, S. F. (1939). The application of intelligence tests in the anthropological field. In F. C. Bartlett, E. Grinsberg, E. J. Lindgren, & R. M. Thouless (Eds.), *The study of society* (pp. 184-198). London: Kegan, Paul Tyrench, Trubner and Co.

Nakamura, K., Newell, A. F., Alm, N., & Waller, A. (1998). How do members of different language communities compose sentences with a picture-based communication system? A cross-culture study of picture-based sentences constructed by Japanese and English speakers. *Augmentative and Alternative Communication, 14(2),* 71-79.

Namy, L. L., Campbell, A. L., & Tomasello, M. (2004). The changing role of iconicity in non-verbal symbol learning: A U-shaped trajectory in the acquisition of arbitrary gestures. *Journal of Cognition and Development, 5(1),* 37-57.

Naudé, E. (2005). *Profiling language in young urban English additional language learners.* Unpublished D. Phil. Communication Pathology. South Africa: University of Pretoria.

Nigam, R. (2003). Do individuals from diverse cultural and ethnic backgrounds perceive graphic symbols differently? *Augmentative and Alternative Communication, 19(2),* 135-136.

Pierce, P. L., & McWilliam, P. J. (1993). Emerging literacy in children with severe speech and physical impairments (SSPI): issues and possible intervention strategies. *Topics in Language Disorders, 13(2),* 47-57.

Quist, R. W., & Lloyd, L. L. (1997). Principles and uses of technology. In L. L. Lloyd, D. R. Fuller, & H. H. Arvidson (Eds.), *Augmentative and alternative communication: A handbook of principles and practices* (pp. 107-126). Boston: Allyn and Bacon.

Renner, G. (2003). The development of communication with alternative means from Vygotsky's cultural historical perspective. In S. von Tetzchner, & N. Grove (Eds.), *Augmentative and alternative communication: Developmental issues* (pp. 67-82). London: Whurr.

Rowland, C., & Schweigert, P. D. (2003). Cognitive skills and AAC. In J. C. Light, D. R. Beukelman, & J. Reichle (Eds.), *Communicative competence for individuals who use AAC: From research to effective practice* (pp. 241-276). Baltimore: Paul H Brookes.

Sacks, S. Z. (1998). Educating students who have visual impairment and other disabilities: An overview. In S. Z. Sacks, & R. K. Silberman (Eds.), *Educating students who have visual impairment and other disabilities* (pp. 3 – 38). Baltimore: Paul H Brookes.

Schlosser, R. W. (1997). Nomenclature of category levels in graphic symbols, Part I: Is a flower a flower a flower? *Augmentative and Alternative Communication, 13(1),* 4-13.

Schlosser, R. W., & Lloyd, L. L. (1993). Effects of initial element teaching in a story-telling context on Blissymbol acquisition and generalisation. *Journal of Speech and Hearing Research, 36,* 979-995.

Schlosser, R. W., & Sigafoos, J. (2002). Selecting graphic symbols for an initial request lexicon: Integrative view. *Augmentative and Alternative Communication, 18(2),* 102-123.

Sevcik, R. A., & Romski, M. A. (1986). Representational matching skills of persons with severe retardation. *Augmentative and Alternative Communication, 2(4),* 160-164.

Sevcik, R. A., Romski, M. A., & Wilkinson, K. M. (1991). Roles of graphic symbols in the language acquisition process of persons with severe cognitive disabilities. *Augmentative and Alternative Communication, 7(3),* 161-170.

Silberman, R. K., Bruce, S. M. & Nelson, C. (2004). Children with sensory impairments. In F. P. Orelove, D. Sobsey & R. K. Silberman (Eds.), *Educating children with multiple disabilities: A collaborative approach (4th ed.)* (pp. 425-527). Baltimore: Paul H Brookes.

Stephenson, J. (2007). The effect of color on the recognition and use of line drawings by children with severe intellectual disabilities. *Augmentative and Alternative Communication, 23(1),* 44-55.

Stephenson, J. (2009a). Iconicity in the development of picture skills: Typical development and implications for individuals with severe intellectual disabilities. *Augmentative and Alternative Communication, 25(3),* 187-201.

Stephenson, J. (2009b). Recognition and use of line drawings by children with severe intellectual disabilities: The effects of color and outline shape. *Augmentative and Alternative Communication, 25(1),* 55-76.

Stephenson, J., & Linfoot, K. (1996). Pictures as communication symbols for students with severe intellectual disability. *Augmentative and Alternative Communication, 12(4),* 244-255.

Taylor, O. L., & Clarke, M. G. (1994). Culture and communication disorders. *Seminars in Speech and Language, 15,* 103-113.

Thistle, J. J., & Wilkinson, K. (2009). The effects of color cues on typically developing preschoolers' speed of locating a target line drawing: Implications on augmentative and alternative communication display design. *American Journal of Speech-Language Pathology, 18,* 231-240.

Visser, N., Alant, E., & Harty, M. (2008). Which graphic symbols do 4-year-old children choose to represent each of the four basic emotions? *Augmentative and Alternative Communication, 24(4),* 302-312.

Von Tetzchner, S., & Grove, N. (2003). The development of alternate language forms. In S. von Tetzchner, & N. Grove (Eds.), *Augmentative and alternative communication developmental issues* (pp. 1-27). London: Whurr.

Ward, J. (2006). *The student's guide to cognitive neuroscience.* New York: Psychology Press.

Webb, V., & Sure, K. (2000). *African voices: An introduction to the languages and linguistics of Africa.* Southern Africa: Oxford University Press.

Wilkinson, K. M., Carlin, M., & Jagaroo, V. (2006). Preschoolers' speed of locating a target symbol under different color conditions. *Augmentative and Alternative Communication, 22(2),* 123-133.

Wilkinson, K., Carlin, M., & Thistle, J. (2008). The role of color cues in facilitating accurate and rapid location of aided symbols by children with and without Down syndrome. *American Journal of Speech-Language Pathology, 17,* 179-193.

Wilkinson, K. M., & Jagaroo, V. (2004). Contributions of principles of visual cognitive science to AAC system display design. *Augmentative and Alternative Communication, 20(3),* 123-136.

Wilkinson, K. M., Romski, M. A., & Sevcik, R. A. (1994). Emergence of visual-graphic symbol combinations by youth with moderate or severe mental retardation. *Journal of Speech and Hearing Research, 37,* 883-895.

Witkin, H. A. (1967). A cognitive styles approach to cross-cultural research. *International Journal of Psychology, 2(4),* 233-250.

Yovetich, W., & Young, T. (1988). The effects of representativeness and concreteness on the guessability of Blissymbols. *Augmentative and Alternative Communication, 4(1),* 35-39.