THE ICONICITY AND LEARNABILITY OF SELECTED PICTURE COMMUNICATION SYMBOLS: A STUDY ON AFRIKAANS-SPEAKING CHILDREN

by

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In loving memory of

WILLEM BASSON,

(14/06/1984 – 20/08/2002)

who taught me to live a day at a time.

Met liefdevolle herinneringe aan

WILLEM BASSON,

(14/06/1984 – 20/08/2002)

by wie ek geleer het om een dag op 'n slag te leef.

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Summary

Everyday communication occurs mostly through speech, thus learners who have little or no functional speech (LNFS) need to augment their communication by using additional communication strategies to ensure that they are able to participate in the interaction process. The use of Augmentative and Alternative Communication (AAC) can and should play an important role in assisting learners with LNFS to access information and services and to communicate. Graphic symbols form an important part of most AAC users' communication systems. Therefore studies which focus on increasing understanding of the way different graphic symbols are learnt and retained by children and adults, are pivotal for a better understanding of the processes involved in graphic symbol learning. Iconicity and learnability of symbols are two important factors to consider when choosing an appropriate graphic symbol set/system.

The purpose of the current study was to determine how accurately typically developing urban, 6-year-old Afrikaans-speaking children could firstly, identify 16 PCS presented thematically on a commercially available communication overlay, and secondly, recognize these symbols following exposure to a learning experience. Forty-six participants, divided into 2 cohorts, were each presented with 16 copies of a 16-matrix overlay and required to match a symbol with a spoken Afrikaans label. The participants were then divided into two groups, one group receiving training in the meaning of the symbols and the other group receiving no training. Finally the test-procedure was repeated with the cohorts.

The results indicated that the 16 PCS symbols had an iconicity of between 12.5 % (accuracy score $\geq$ 50 %) and 25 % (accuracy score $\geq$ 75 %) for the combined group. Results further indicated a significant improvement in both the experimental and the control groups' post-test results. The significant difference between the two groups' post-test results does, however, indicate that the experimental group recognized more symbols during the post-test administration than the control group and they had thus benefited from the training session. The control group's better post-test results can be attributed to the single exposure through the pre-test procedure.

The participants made use of the information afforded them by the postural cues implying motion. They did not, however, make full use of the arrow cues or the direction of the arrows, which also implied motion. Once the participants of the experimental group were made aware of the arrows, they seemed to

use the information the arrows offered to help them remember the symbol meanings during the post-test procedure.

Key words

Accuracy scores, Augmentative and Alternative Communication, Communication overlay, Iconicity, Learnability, Recognition

Opsomming

Alledaagse kommunikasie vind hoofsaaklik plaas deur gesproke taal. Daarom is dit nodig dat leerders met min of geen funksionele spraak hul kommunikasie aanvul deur gebruik te maak van addisionele kommunikasie strategieë. Die gebruik van Aanvullende and Alternatiewe Kommunikasie (AAK) kan, en behoort, ‘n integrale deel te vorm van die wyse waarop hierdie leerders kommunikeer en inligting en dienste bekom. Grafiese simbole vorm ‘n integrale deel van die meeste AAK gebruikers se kommunikasie stelsels. Vir beter begrip van die wyse waarop hierdie simbole aangeleer en onthou word, is studies oor hoe kinders en volwassenes simbole leer en onthou van groot waarde Die ikonisiteit en leerbaarheid van simbole is twee belangrike faktore wat inaggeneem moet word wanneer ‘n grafiese simboolstel of -stelsel gekies word.

Die doel van hierdie studie was eerstens om vas te stel hoe akkuraat tipies ontwikkelende stedelike 6 jaar oud Afrikaans-sprekende kinders 16 PCS, tematies gerangskik, kon identifiseer en tweedens, kon herken na ‘n opleidingssessie. Ses-en-veertig deelnemers , verdeel in 2 kohorte, het elk 16 kopië van ‘n 16 matriks ontvang. Daar is van hulle verwag om ‘n simbool by ‘n gesproke Afrikaanse etiket te pas. Die deelnemers is daarna in 2 groepe verdeel. Die een groep het opleiding in die symbole ontvang en die ander groep nie. Na afloop van die opleiding is die toetsprosedure met die kohorte herhaal.

Die bevindinge het gewys dat die 16 PCS simbole ‘n ikonisiteit van tussen 12.5 % (telling $\geq$ 50 %) en 25 % (telling $\geq$ 75 %) vir die saamgestelde groep het. Verder het die bevindinge ‘n beduidende verbetering getoon vir beide die eksperimentele en kontrole groepe se na-toets resultate. Die beduidende verskille tussen die twee groepe se na-toets resultate dui egter aan dat die eksperimentele groep meer simbole tydens die na-toets administrasie herken het as die kontrole groep. Die kontrole groep het dus baat gevind by die opleidingssessie. Die kontrole groep se verbetering kan toegeskryf word aan die enkele blootstelling tydens die voor-toets prosedure.

Die deelnemers het gebruik gemaak van die inligting verskaf deur postuur leidrade wat beweging
v
impliseer. Hulle het egter nie ten volle gebruik gemaak van inligting wat deur pyle en pylrigtings verskaf is nie. Na afloop van die opleidingssessie, waartydens die eksperimentele groep bewus gemaak is van die

inligting wat pyle moontlik kon verskaf, het dit geblyk dat hulle die inligting gebruik het om te help met die onthou van die simbole.

Sleutelwoorde

Tellings, Aanvullende and Alternatiewe Kommunikasie, Ikonisiteit, Leerbaarheid, Herkenning

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

Augmentative and alternative communication (AAC) refers to those strategies that can be used to supplement the existing communication of an individual with little or no functional speech (LNFS). Although these strategies span the use of a broad range of aided and unaided methods, graphic symbols form a very important part of most AAC systems. For example, for most AAC users who might be using unaided systems, access to an aided system, be it pictographic or arbitrary (traditional orthography) in nature, will form an important part of their communication system.

It is therefore no surprise to find a great number of research studies on issues related to graphic symbols and their use within the field of AAC. These research studies largely stem from the acknowledgement of the importance of the characteristics of the individual graphic symbols and how these match the abilities and experiences of the individuals who need to use an AAC system.

When selecting an appropriate symbol set/system for AAC users, iconicity is one of the variables to consider (Fuller & Lloyd, 1997). The iconicity hypothesis postulated by Fristoe and Lloyd (1979) states that the visual representation afforded by some AAC symbols may facilitate the learning and memory of symbol referent associations. Fuller and Stratton (1991) explain that symbols with a strong relationship to their referents would be easier to learn and remember than symbols with a weak relationship. According to Fuller and Lloyd (1997) research done with aided and unaided symbols have supported this iconicity hypothesis, with more translucent sets/systems being easier to learn and recall than less transparent sets/systems (Clark, 1981; Mizuko, 1987; Mizuko & Reichle, 1989).

Brown, cited in Sevcik, Romski & Wilkinson (1991), cautioned that iconicity is cultural-, time- and experience-bound. Duncan, Gourlay and Hudson (1973); Miller (1973) and Deregowski (1980) all investigated visual perception and cross-cultural differences in the perception of pictorial materials. Before visual similarity between a symbol and referent can be perceived, perception of the symbol must take place (Stephenson & Linfoot, 1996). As iconicity can be defined as the degree to which an individual perceives visual similarity between a symbol and its referent (Blischak, Lloyd & Fuller, 1997), factors influencing visual perception would probably influence a symbol's iconicity for a given viewer (Haupt & Alant, 2002). Some of these factors discussed in literature are: schooling (Duncan et

al., 1973; Martlew & Connolly, 1996), material on which symbols are printed (Deregowski, 1980) and previous experience with symbols (DeLoach, 1991; Duncan et al., 1973; Miller, 1973; Stephenson & Linfoot, 1996).

Haupt and Alant (2002) also emphasized the link between visual perception and the connection with culture. According to Taylor and Clarke (1994, p. 103) culture is 'a set of behaviors, 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'. Iconicity thus needs to be studied in the context of a specific culture. To date, most iconicity studies have been done within European-American linguistic communities (Huer, 2000). It cannot be taken for granted that results obtained from iconicity studies on one group of people can be generalized to another (Haupt & Alant, 2002).

While a literate communication partner can read the accompanied gloss (written text), illiterate communication partners have to rely on symbol iconicity to guess the symbol's meaning. Issues surrounding iconicity of symbols become particularly important in populations where a large percentage of people might be illiterate, as for example, in South Africa. People's interpretations on first exposure to graphic symbols can be particularly important in facilitating interaction within this population group. The study by Haupt & Alant (2002), conducted on a rural Zulu-speaking population was of particular interest because of the largely oral tradition that characterizes the Zulu culture.

Iconicity (first exposure impression) is, however, not the only important variable when choosing a symbol set/system. The ease with which a symbol set/system can be learned (learnability) is also important, as most symbols will not be totally transparent or translucent. Haupt and Alant (2002) investigated the iconicity of selected PCS in the context of a South African culture. They found that the 36 symbols presented to rural Zulu-speaking participants had a generally low average iconicity of between 2.8% (iconicity values = 75%) and 11.1% (iconicity values = 50%). Although iconicity is an important issue in symbol learning, ease of learning is an important additional issue that needs to be addressed when deciding on a specific graphic symbol set or system.

Studies should therefore not only look at the responses of individuals at first exposure, but also at learnability. The current study will strengthen the understanding of issues relating to iconicity in different cultural groups, by investigating the iconicity of selected PCS symbols for Afrikaans-speaking children. Afrikaans is spoken by 14.4% of the South African population, the third most spoken home language in South Africa (Orkin, 1998). This investigation in the way in which Afrikaans-speaking children relate to PCS symbols could yield important information for the use of PCS symbols in order to facilitate symbol learning and use. The study will further extend our knowledge about PCS symbols, by describing the ease of learning for this group of children by comparing two groups' pre-and-post performances: group one after being exposed to a single learning experience and group two, the control group.

1.2 Chapter Outline

Chapter one presents a brief problem statement and introduction to the study. It offers an outline of each chapter and explains important terms and abbreviations used throughout the study.

Chapter two gives the theoretical background to the study. Concepts mentioned in chapter one are expanded upon and relevant research and literature discussed.

In *chapter three* the research methodology is set out. A detailed description of the aims of the study; the research design; the participant selection and participants; material; data collection procedures, analysis and processing of the data as well as the results of the pilot study, is given.

Chapter four presents the results and a discussion of results obtained in the main study.

In *chapter five* results are integrated and the study is critically evaluated and recommendations for further studies are made.

1.3 Definition of terms

Accuracy score This term can be defined as the percentage correct selections of a symbol in response to its spoken label.

Augmentative and Alternative Communication (1) The supplementation or replacement of natural speech and/writing using aided and/or unaided symbols. (2) The field or area of clinical/educational practice to improve the communication skills of individuals with little or no functional speech (Lloyd, Fuller & Arvison, 1997, page 524).

Communication overlay In general this term refers to letters, words, pictures or graphic symbols that have been arranged on paper or other material (Quist & Lloyd, 1997) to serve as an assistive communication device.

Iconicity This term refers to the visual relationship between a symbol and its referent and includes *transparency and translucency* (Fuller & Lloyd, 1991; Blischak, Lloyd & Fuller, 1997), while the absence of iconicity is called *opaqueness* (Fuller & Lloyd, 1997). *Transparency* is used to describe the guessability of a symbol in the absence of its referent, while *translucency* refers to the degree to which individuals perceive a relationship between a symbol and its referent when the referent is known (Blischak, et al., 1997).

Iconicity values This term can be defined as the number of participants who respond correctly to each item and represents each symbol's guessability (Haupt, 2001).

Learnability The ease with which a symbol can be learned by an AAC user or the individual communicating with the AAC user.

Little or No Functional Speech (LNFS) The term is used to refer to individuals who have less than 15 intelligible words (Cantwell & Baker, 1985).

Recognition For recognition a person does not need to retrieve or construct information learned previously, but only recognize it when it is presented (Light & Lindsy, 1991).

1.4 Abbreviations

AAC	Augmentative and Alternative Communication
LNFS	Little or No Functional Speech
PCS	Picture Communication Symbols
P	Participant
Ps	Participants
R	Researcher
ECD	Early Childhood Development
FES	First Education Specialist

1.5 Summary

This chapter gave a brief outline of the study. The chapters are outlined and definitions and abbreviations important for the rest of the study are given.

CHAPTER 2
ICONICITY, LEARNABILITY, PICTURE PERCEPTION AND CULTURE.

2.1 Introduction

This chapter will focus on the iconicity and learnability of graphic symbols and factors, for example, cultural experiences that might influence these processes. Firstly, research on iconicity will be discussed by describing the methodologies used in different studies providing a background to the study. Findings will also be discussed in terms of the symbol sets/systems used and the parts of speech. Secondly, studies conducted on learnability will be discussed, describing methodological issues as well as specific symbols researched. Finally, issues such as cultural context, experience and the impact on symbol recognition and learnability will be highlighted.

2.2 Iconicity

Iconicity is a general term referring to the visual relationship between a symbol and its referent (Fuller & Lloyd, 1991; Blischak, Lloyd & Fuller, 1997). The iconicity of a symbol can be described in two ways, with transparency being used to describe the guessability of a symbol in the absence of its referent, while translucency is used to refer to the degree to which individuals perceive a relationship between a symbol and its referent when the referent is known (Blischak, et al., 1997). Opaqueness is the term used where iconicity is absent altogether and the observer can perceive no relationship between the symbol and its referent (Fuller & Lloyd, 1991).

Several studies have been conducted on the iconicity of aided and unaided symbol sets/systems (Bloomberg, Karlan, & Lloyd, 1990; Haupt & Alant, 2002; Luftig & Bersani, 1985; Mirenda & Locke, 1989; Mizuko, 1987; Mizuko & Reichle, 1989; Musselwhite & Ruscello, 1984). Table 2.1 provides a summary of several studies investigating the iconicity/ transparency/ translucency of aided sets/systems. Some studies combined these investigations with the ease of learning or recall. The latter studies are summarized in Table 2.2.

TABLE 2.1 A summary of studies investigating iconicity / transparency / translucency.

Title, authors, year	Objectives	Symbols	Participants	Method ology	Results	Shortcomings and clinical recommendations.
The iconicity of selected Picture Communication Symbols for rural Zulu-speaking children. Haupt & Alant (2002).	• To select a commercially available communication overlay. • To determine how accurately 10-year-old Zulu-speaking children select the correct symbol in response to its spoken label. • To describe error patterns.	PCS	• 94 Zulu-speaking 10-year-olds. • Participants resident in a rural area.	• Participants were presented with a commercially available 36-matrix overlay. • Labels were called out in their mother tongue, isiZulu. • Participants had to indicate which symbol goes with which label.	• Generally low iconicity: average iconicity 2,8% or 11,1%, depending on criterion used. • Term 'distinctiveness' coined; describes whether a symbol evokes precise meaning, or multiple or no meanings in the viewer's mind.	• Small sample. • Further investigation of iconicity of PC S for South African cultures. • Term "distinctiveness" needs validation.
The comparative translucency of initial lexical items represented in 5 different graphic symbol systems and sets. Bloom berg, Karlan & Lloyd, (1990).	• To compare translucency within and across 5 aided AAC symbol sets/systems. • Symbols represented 3 parts of speech: nouns, verbs and modifiers.	Rebus Blissymbols PCS PIC Picsyms	• 50 naïve undergraduate university students.	• Symbols with labels were provided. • P required to rate the visual similarity of the label to its symbol on a scale of 1 to 7.	• Nouns were significantly more translucent than verbs or modifiers, regardless of the sets/systems. • Picsyms and Blissymbols: verbs and modifiers equally translucent. • Rebus, PCS and PIC; verbs significantly more translucent than modifiers. • Considering most parts of speech (most translucent to least): Rebus and PCS (equivalent); PIC and Picsyms (equivalent); Blissymbols.	• Symbol sets/systems are not internally consistent regarding translucency. • An initial lexicon could include symbols selected from a variety of sets/systems after considering the translucency of the symbol and the experience of the user.

A comparison of symbol transparency in non-speaking persons with intellectual disabilities. Mirenda & Locke, (1989)	• To determine if there is a predictable hierarchy of symbol transparency for persons with limited language ability. • If so, to determine where the most common symbol sets/systems fall in this hierarchy. • To test a screening procedure for assessing symbol transparency.	• Non identical objects • Miniature objects • Identical colour photographs • Non identical coloured photographs • Black and white photographs • PCS • Picsyms • Rebus • Self-talk • Blissymbols • Written words	• 40 participants, - all non-speaking (according to ASHA 1981). • Between the ages of 3:11 and 20:10 with the mean age of 11:05 (yy:mm). • Mildly to severely handicapped (as diagnosed).	Three test protocols were used: Screening determined which one was used. *Standard receptive language protocol:* P matches symbol to spoken label (two-choice task) *Alternate 'yes-no' protocol:* P answers yes or no to question, "Is this a target label?" *Matching protocol:* P required to match symbol with object and vice versa.	• The following hierarchy emerged (easiest to most difficult): objects, colour photographs, black and white photographs, miniature objects, Picsyms, Self-Talk, PCS, Rebus, Blissymbols and written words (this was based on the mean number across participants). • This hierarchy only applies to nouns (only nouns were used in the study). • Symbols assessed were significantly less transparent than the objects.	• These results might be the best possible results, because of the use of two-choice protocols. • This hierarchy appears to be uniform across the different intellectual disabilities studies. It is, however, still important to choose a symbol set/system in collaboration with the individual and significant others concerned. • Study should be repeated using more symbols and more trials per symbol.
An initial investigation of translucency, transparency and component complexity of Blissymbolics. Luftig & Bersani, (1985a).	• To measure transparency and translucency of a large sample of Blissymbols. • To investigate the effect of component complexity on transparency and translucency.	Bliss	• 95 undergraduate college students.	• Translucency: video consisting of 200 Blissymbols, presented together with its written and spoken label. Subjects required to rate visual similarity on a scale of 1 to 7. • Transparency: video containing same Blissymbols. Subjects required to guess the meaning of each symbol.	• Translucency and transparency values were determined. • Transparency low. • No differences between word classes. • The number of components negatively influenced translucency and transparency values .	• Verbs were not more transparent than nouns, as is the case with manual signs. Possibly because the action indicator is opaque.

Transparency of three communication symbol systems. Musselwhite & Ruscello, (1984).	• To study the transparency of three communication symbols for non-handicapped viewers. • To study subjects' impressions of the symbol systems.	Blissymbols Picsyms Rebus Blissymbols Picsyms Rebus	• 48 typically developing subjects. • 4 age groups I: 3:0-3:11 II: 6;0-6:11 III: 9;0– 11 IV: 18:0-21:11	• Test booklet with 40 symbols. • All items N presented with 3 foils. • Label presented and subject required to match to symbol. • Subject reactions obtained from 10 subjects each from groups III and IV	• Blissymbolics less transparent than Picsyms and Rebus. • All subjects, except one, felt that Bliss were the most difficult. • Age significantly influenced performance. • Gender did not influence performance.	• Transparency is especially important when an AAC user has to interact with nonreaders. • The transparency of these sets/symbols should be studied individually including more symbols.

TABLE 2.2 A summary of studies investigating iconicity / transparency / translucency and ease of learning and recall.

Title, authors, year	Objectives	Symbols	Participants	Methodology	Results	Shortcomings and clinical recommendations.
Transparency and recall of symbols among intellectually handicap-ped adults. Mizuko & Reichle, (1989).	• To investigate whether there are transparency and recall differences across different graphic systems within 3 different word categories (nouns, verbs, descriptors	Blissymbols PCS Picsyms	• 21 participants: speaking intellectually handicapped adults, aged 22: 4 • 60:7 (mean age 37:74)	• *One trail transparency task:* select symbol that best resembles spoken label from between three foils • *Three trails recall task:* as above, R corrects any mistakes made.	• PCS and Picsyms more transparent and easier to learn than Blissymbols. • Nouns: fewer Blissymbols correctly identified than either PCS or Picsyms; Picsyms more transparent than PCS. • Verbs and descriptors: PCS and Picsyms similar.	• Lack among three symbol sets for verbs and descriptors does not support earlier study (Mizuko, 1987) • Future investigations: larger number of recall opportunities.
Transparency and ease of learning symbols represented by Blissymbols, PCS and Picsyms. Mizuko, (1987).	• To compare systems. • To compare transparency and ease of learning of symbols across three different symbol sets and three different word categories.	Blissymbols PCS Picsyms	• 36 normal developing pre-schoolers (29 – 44 months old)	• 45 target symbols presented with 3 foils each. • Transparency: P required to match symbol with spoken label. • Learning: as above, but repeat 3 times, if P makes a mistake R corrects P.	• PCS and Picsyms more transparent and easier to learn than Blissymbols, regardless of category. • Nouns: PCS and Picsyms similar in transparency. • Verbs and descriptors: PCS more transparent than Picsyms. • More PCS learned than Picsyms or Blissymbols.	• Study does not address the issue of effective long-term communication (Mizuko, 1987). • PCS and Picsyms may be used as an immediate means of communication for disabled people with spoken comprehension skills close to 3 years. • Long-term communication system needed; other aspects than learnability alone should be considered.

When reviewing Tables 2.1 and 2.2 it is evident that the studies employed varied methodologies to investigate iconicity. Translucency studies require participants to rate the visual similarity of the symbol to its referent on a scale of 1 to 7 (Bloomberg, et al., 1990; Luftig & Bersani, 1985). The participants are given both the symbol and its meaning and have to indicate how strong they perceive the relationship between the symbol and the referent to be. A rating of "1" indicates little or no relationship, while a rating of "7" represents a very strong relationship between the symbol and its referent (Luftig & Bersani, 1985).

Transparency studies typically employ one of two methods. The first method, a forced-choice task, requires participants to match a spoken label with a symbol from a closed set of alternatives (Mirenda & Locke, 1989; Mizuko, 1987; Musselwhite & Ruscello, 1984). The presentation is usually in the form of a grid with the target symbol and three foils of the same symbol type. Mirenda and Locke (1989) employed two-choice discrimination protocols in their study, which compared symbol transparency in non-speaking persons with intellectual disabilities.

Other transparency studies use an open-choice task that requires the participants to guess the meaning of a symbol presented to them (Luftig & Bersani, 1985). Musselwhite and Ruscello (1984) reasoned that a forced-choice task might be easier than an open-choice task, probably resulting in the best performance possible. As mentioned previously, during forced-choice tasks target symbols are usually presented on a grid with one to three foils from the same symbol type. Mirenda and Lock (1989) mentioned that communication books, boards, etc., typically contain more than two symbols and that the inclusion of a larger number of symbols in iconicity tasks might yield more accurate results for intervention purposes.

Haupt and Alant (2002) used a 36-matrix commercially available communication overlay to present PCS symbols to the Zulu-speaking participants in their study. The 36 symbols acted as foils for each other and were rotated to act as the target symbol. Although all the symbols in this presentation were related to the same topic and this could have influenced the iconicity values, symbols are most often used in context and communication books (Haupt & Alant, 2002) which increases the social validity of the study.

Further review of the studies in Tables 2.1 and 2.2 clearly shows that Blissymbols are, either on their own or in combination with other symbol systems/sets, the symbol system most used in these studies (Bloomberg, et al., 1990; Luftig & Bersani, 1985; Mirenda & Locke, 1989; Mizuko, 1987; Mizuko &

Reichle, 1989; Musselwhite & Ruscello, 1984). The PCS symbol set was used in five of these studies (Bloomberg, et al., 1990; Haupt & Alant, 2002; Mirenda & Locke, 1989; Mizuko, 1987; Mizuko & Reichle, 1989). Fuller, Lloyd and Stratton (1997) categorized PCS in the group of picture-based symbols without linguistic characteristics as it can be seen as a collection of line drawings and/or pictures that have no logic base for the expansion of symbols beyond the vocabulary.

Studies comparing different symbol sets/systems also investigate the iconicity of different parts of speech. In their study comparing PCS to ten other types of symbols, Mirenda and Locke (1989) found PCS to be more transparent than Rebus and Bliss and less transparent than Self-talk and Picsyms. This study looked only at the word category of nouns. Bloomberg, et al. (1990) asked university students to rate the translucency of Rebus, Blissymbols, PCS, PIC and Picsyms. The symbols represented three parts of speech namely nouns, verbs and modifiers. The results indicated that nouns were significantly more translucent than verbs or modifiers, regardless of the set/system. PCS verbs were more translucent than PCS modifiers. Considering all three parts of speech Rebus and PCS were equivalent and more translucent than PIC, Picsyms (equivalent) and Bliss.

One of Mizuko's (1987) objectives was to compare the transparency of Bliss, PCS and Picsyms across the set/systems and within the set/systems across three different word categories. PCS and Picsyms were found to be more transparent than Bliss. For nouns PCS and Picsyms were similar in transparency, but PCS were found to be more transparent than Picsyms for verbs and descriptors. In a follow-up study Mizuko and Reichle (1989) also found PCS and Picsyms more transparent than Blissymbols. In this study Picsyms nouns were more transparent than PCS nouns, with verbs and descriptors in these two sets being equally transparent.

Results of Haupt and Alant's (2002) study revealed that the 36 PCS symbols relevant to their study were between 2,8 % (iconicity values $\geq$ 75 %) and 11,1% (iconicity values $\geq$ 50 %) iconic for the participants involved. The unique nature of the task could have resulted in symbols influencing each other (Haupt & Alant, 2002). When grammatical categories from Haupt's (2001) study were investigated, it appeared that nouns as a group were indicated more often than the other categories. The two single symbols with the highest iconicity values were verbs. Although not tested statistically, it seemed that nouns were perceived as more iconic.

Iconicity studies provide evidence of first exposure. When selecting a system for a potential AAC user certain variables might be important considerations for some, but only minor concerns for others

(Musselwhite & Ruscello, 1984). Iconicity would be an important consideration for individuals who communicate frequently with non-readers or interact with a wide variety of people, some of whom may be non-readers (Musselwhite & Ruscello, 1984).

Another important variable to consider is ease of acquisition (Clark, 1981; Mizuko, 1987; Mizuko & Reichle, 1989). Clark (1981) feels that for far too long learning time has been wasted in trying to master a system that places a heavy load on the memory and processing of the AAC user.

2.3 Learnability

According to the iconicity hypothesis (Fristoe & Lloyd, 1979), symbols with a strong relationship with their referents (high iconicity) will be easier to learn than symbols with a weaker relationship (low iconicity) (Fuller & Stratton, 1991). The summary of the results in Table 2.2 of studies by Mizuko (1987) and Mizuko and Reichle (1989) confirms this. In both studies, using two different populations, PCS and Picsyms were more transparent and easier to learn than Blissymbols.

There are two basic procedures to test what has been learned, namely recall and recognition (Light & Lindsay, 1991). With a recall task the participant must learn the information and then be able to remember or reconstruct it at a later date. The participant must either recall in response to general instructions or in response to a specific cue. Recall involves a two-stage process where the participant must first of all construct the originally encoded information from the clues presented. When the code is retrieved the participant must decide whether or not the retrieved item is correct. Recall thus requires both a search of memory of potential candidate items and a recognition process to decide whether the chosen candidate item is indeed correct (Atkinson & Juola and Mandler, cited in Light & Lindsay, 1991). An example of a way to test recall memory is the "paired associates learning paradigm'' (Light & Lindsay, 1991). During teaching the target items are paired with specific words; which are later used to prompt recall.

With recognition memory, the participant does have to retrieve or reconstruct learned information, but only be able to recognize it when the target item is presented at a later stage (Light & Lindsay, 1991). Recognition memory can be tested using a "yes/no" or "forced-choice" procedure where the participant chooses the target item from between foils when hearing the label called out. Recall memory can fail at either of the stages, while recognition memory does not require the search stage and is therefore usually better than recall memory (Light & Lindsay, 1991).

A number of studies have been done investigating ease of learning, using recall or recognition procedures. Some of these studies combined ease of acquisition with iconicity investigations and arre listed in Table 2.2. Further summaries of studies can be found in Tables 2.3 and 2.4.

TABLE 2.3 A summary of studies investigating ease of learning and recall

Title, authors, year	Objectives	Symbols	Participants	Methodology	Results	Shortcomings and clinical recommendations.
Initial study into the effects of translucency and complexity on the learning of Blissymbols by children. Fuller, (1997).	• Study the effect of translucency on the learning of Bliss. • The effect of complexity on the learning of Bliss.	Bliss	• 13 adult volunteers (mean age: 20,69 years) • 11 children (Chronological. age within 54 – 66 months).	• 40 symbols randomly selected. • Symbols assigned to 1 of 4 conditions (HTLC, HTHC,LTLC, LTHC). • Symbols taught through paired-associate learning paradigm. (L = low H = high T = translucency C = complexity).	• Adults acquired more Blissymbols in each condition than did children. • Translucency appears to be a powerful variable in associative learning of Blissymbols by pre-school children and adults with normal cognitive abilities. • More HT symbols acquired than LT symbols. • Complexity appears to have an effect on children when learning Blissymbols. • When LT pre-school children seem to use complexity to whatever advantage they can.	• Paired-associate learning task does not occur in the actual learning environment.
A comparative study of language-delayed preschool children's ability to recall symbols from two symbol systems. Burroughs, Albritton, Eaton , & Montague, (1990).	• To contrast the learning of the Rebus and Bliss symbol systems with language-delayed pre-schoolers.	Rebus Bliss	• 26 black children. • 16 males. • 10 females. • Age:4.1 to 6.6. • English first language. • Normal vision & hearing.	• Same 15 symbols as Clark (1981) • Each subject tested with both symbols • 2 groups.	• Order of test administration– no influence. • Subjects recalled significantly more Rebus than Bliss before training. • Subjects recognized significantly more Rebus than Bliss after training. • Improvement in Bliss seen.	• No learning effect from one test administration to another; a clinician could select one system and later change to another knowing that systems function independently.

A comparison of normal children's ability to recall symbols from two logographic systems. Ecklund & Reichle, (1987).	• To compare ease of symbol recall of Bliss and Rebus symbols during initial vocabulary. • Recall performance as a function of a verbal and a pointing mode.	Rebus Bliss	• 32 children • Aged 38 to 65 months. • Receptive language = chronological age. • Mother-tongue speakers of English. • No handicapping conditions.	• 2 experimental conditions. • Conditions were further divided. • The materials and instructional protocol were identical. • Subjects had to recall Bliss/ Rebus after repeated exposure to 15 symbols.	• Significant differences between Bliss and Rebus groups; more Rebus than Bliss recalled. • Differences in response mode not significant. • Rebus symbols maintained significantly better than Blissymbols . • Participants who made use of pointing maintained significantly more than verbal group.	• Results agree with data reported by Clark (1981). • Results statistically significant, not clear if clinically significant. • Recommendation: expand the time between the recall training and the maintenance probe.
An investigation of two variables influencing Blissymbol learn-ability with nonhandicapped adults. Luftig & Bersani, (1985).	- Influence of component complexity on Blissymbol learn-ability. - Interactive effects between translucency & component complexity. - Investigate phase of learning where translucency has greatest influence	Blissymbols	• 65 undergraduate students.	• 4 symbol sets of 15 symbols; selected on basis of component complexity and perceived translucency (HTLC, HTHC, LTLC, LTHC). • Paired - associate learning paradigm. • A criterion for ending trials was one perfect trial of the 15 symbols. (L = low H = high T = translucency C = complexity)	• High translucent symbols were learned faster than symbols judged low in translucency. • Symbols with higher number of components were more difficult to learn than symbols with few components.	• Results from study indicate that effects of learning for HT symbols occurred in earliest learning trials. • Current experiment: non - andicapped person's learning could be affected by varying levels of translucency, and to lesser extent, component complexity.

Learning words using traditional orthography and the symbols of Rebus, Bliss, and Carrier. Clark, (1981).	• To compare ease of learning of words represented by traditional orthography and logographic symbols.	Traditional orthography (T.O.) Rebus Bliss Carrier	• 36 normal developing children. • 4.3 to 5.4 yrs of age. • Multi-ethnic. • Varied socio-economic backgrounds. • First language English. • Non-readers.	• Participants divided in-to treatment groups. • 15 words. • Participants shown stimulus page; told word(s); asked to repeat. • Response incorrect / no response – participants were told the words. • Procedure continued until last page, subject had to name each of 15 words.	• Rebus group: highest mean; smallest standard deviation. • T.O. group; smallest mean; greatest standard deviation. • Performance level of logographic systems higher than in T.O. condition. • Performance level of iconic logographs higher than non-ionic logographs. • Rebus group: greater number correct on the measured criterion than Bliss group.	• The more meaningful or iconic the representation, the easier or faster the word is learned. • Ease of accusation should be an important factor when selecting a symbol set/system. • It is important to consider the overall purpose of the system (permanent versus non-permanent use).

TABLE 2.4 A summary of studies investigating teaching strategies when teaching Bliss

Title, authors, year	Objectives	Symbols	Participants	Methodology	Results	Shortcomings, and clinical recommendations.
Shrinking Kim: effects of active versus passive computer instruction on the learning of element and compound Blissymbols. Hetzroni & Lloyd, (2000).	• To investigate the effects of active versus passive instruction. • To investigate the effects of teaching Blissymbol elements before & during instruction of compound Blissymbols on the learning of those symbols.	Blissymbols	• 72 pre-schoolers with no disabilities. • Age: between 3:6 to 6:0. • Primary language: English. • Lack of familiarity with Bliss.	• Between-participant experimental design. • 4 experimental & 2 control groups. • Control groups; no formal instruction, but 1 group was exposed to the story. • Experimental groups: exposed to story & 1 of 4 experimental conditions. • I: active learning with teaching elements before teaching compounds. • II: passive learning with teaching elements before teaching compounds. • III: active learning with teaching elements while teaching compounds. • IV: passive learning with teaching elements while teaching compounds. • Computer was used for screening, for story display, instructional sessions, and testing of learning, generalization & retention.	• Teaching strategies using active learning resulted in higher scores than those using passive learning. • Active learning influenced the number of novel components identified by participants. • Teaching elements before and while teaching compound Blissymbols resulted in 1, the identification of a similar number of symbols during the post-test and, 2, retention tests. • Results suggested that transparency was higher for elements than for compounds	• Both teaching strategies (teaching symbol elements before & while teaching compounds) appear to be equally well-suited for teaching element and compound Blissymbols. • Future research should control the number of exposures to specific elements during instruction. • Because normal pre-schoolers were used questions about the generalizability of the study existis. • The authors feel the study investigated general issues related to Blissymbol learning and therefore the choice to use participants without disabilities was made in order to minimize time and energy demands.

Comparison of two training methods in the learning and generalization of Blissymbols. Shepherd & Haaf, (1995).	• To examine two training methods for teaching Blissymbols • To examine the influence of age on learning.	Blissymbols	• 40 non-handicapped children. • Age: 6 year old group & 12-year group.	• 18 Blissymbols used. • Method I: taught through paired association. • Method II: taught both the composite meaning of symbol as well as the meaning of the elements. • P trained; then tested for rate of learning & generalization. • 8 weeks later learning and generalization were retested.	• Results demonstrate significant differences for both age and teaching method on learning and generalization. • Regardless of age participants learned more when the meanings of elements were included in training. • Participants who received symbol element training were better able to generalize to identification of novel symbols. • At retest, participants who were taught meaning still performed slightly better-	• Appeared easier to learn Bliss when training included compound elements. • Training of components had a positive effect on generalization. • 12 year olds found it easier to learn and generalize. • Age effect diminished over the 8-week interval. • Results of study seem to support the contention that training symbol elements together with the overall gloss results in faster learning of Blissymbols. • Generalizability of study limited, because of use of non-handicapped participants.
Effects of initial element teaching in a story-telling context on Blissymbol acquisition and generalization. Schlosser & Lloyd, (1993).	• To determine the effects of initial teaching of semantic elements on compound Bliss	Bliss	• 40 pre-school children • Normal cognitive abilities. • Mean age: 45 months.	• 2 groups (between - group design with between-group comparison)	• Initial teaching of elements did not contribute to compound acquisition & retention.	• It is possible that acquisition and retention require different skills. • Hypotheically: acquisition - mastered primary through instant recall; retention testing – more reliance on analysis of cues.

	acquisition, retention and generalization in a storytelling context			• Group I: taught elements before being taught compounds containing these elements. • Group II: taught elements before being taught compounds consisting of elements not taught. • Both groups: instruction in compounds taught directly.	• Initial teaching of elements did, however, facilitate generalization to untrained compound Blissymbols.	• Openness needs to be "taught". • Children with normal cognitive abilities seem to benefit from initial element teaching to use the system to its fullest. • Most likely users with cerebral palsy and without cognitive impairment will also benefit. • Further research is needed to determine whether persons with cognitive impairments would also benefit. • Storytelling context maintained children's attention throughout task.

Review of the methods used in the studies presented in Tables 2.2, 2.3 and 2.4 show that Hetzroni and Lloyd (2000), Mizuko (1987) and Mizuko and Reichle (1989) tested learning through recognition tasks, while other authors used recall tasks (Burroughs, Albritton, Eaton & Montague, 1990; Clark, 1981; Ecklund & Reichle, 1987; Fuller, 1997; Luftig & Bersani, 1985, Shepherd & Haaf; 1995). These studies confirm the iconicity theory (Fristoe & Lloyd, 1979) with more iconic symbols learned more quickly. In addition to recall, Ecklund and Reichle (1987) investigated maintenance and found that the more iconic set of Rebus symbols were better maintained than the Blissymbols.

Again Blissymbols was the system used in seven of the nine studies. PCS symbols were only used in the two studies investigating transparency and ease of learning/recall (Mizuko, 1987; Mizuko & Reichle, 1989). These two studies used different subject groups and results about which of PCS and Picsyms were the most transparent were inconclusive. It was, however, clear that PCS and Picsyms were significantly more transparent and easier to learn than Blissymbols.

Different teaching strategies can further influence symbol learning. Some studies make use of paired associated learning paradigms. Clark (1981), Burroughs et al. (1990) and Ecklund and Reichle (1987) made use of the same basic method of displaying and teaching symbols in their studies. Clark (1981) found that the more meaningful or iconic the representation, the easier or faster the symbol was learned, with the Rebus group having a greater number correct on the measured criterion than the Bliss group. Burroughs et al. (1990) and Ecklund and Reichle (1987) found similar results with more Rebus being recalled than Blissymbols.

Fuller (1997) and Luftig and Bersani (1985) also used paired associate learning paradigms to present the symbols-referent pairs to the subjects. Fuller (1997) mentioned that he used this paired-associate paradigm for control reasons and that this process does not typically occur in the actual learning environment. The symbols were not used within a communicative context and a more realistic method of presentation might have affected the results.

Blissymbols are taxonomically classified as an aided-static-iconic system, and have a logic base for creating new symbols (Fuller, Lloyd & Stratton, 1997). The system characteristics unique to Blissymbols may lend themselves to teaching strategies other than the paired associate paradigm (Schlosser & Lloyd, 1993). Several of these studies have been conducted (Hetzroni & Lloyd, 2000; Schlosser & Lloyd, 1993 and Shepherd & Haaf, 1995). These studies are presented in Table 2.4.

Shepherd and Haaf (1995) compared two ways of teaching Bliss. Participants in group I were taught composite Blissymbols through paired association, while participants in group II were taught both the composite meaning and the meanings of the elements forming the composite symbol. The authors found that participants who were trained in the different symbol elements reached their goal sooner than those trained through the paired association task. Schlosser and Lloyd (1993) found that the initial teaching of elements of Blissymbols by themselves, followed by the teaching of compound symbols that contained these elements had a greater effect on later learning of compound symbols than the learning of elements within the context of compound learning. Hetzroni and Lloyd (2000) found that two teaching strategies (teaching symbol elements before and while teaching compounds) respectively, appeared to be equally well-suited to teaching elements and compound Blissymbols. These authors also found active learning where the participant actively takes part in the learning, to be a powerful teaching strategy.

The studies presented in Table 2.4 only investigated teaching strategies when teaching Bliss. The studies of Mizuko (1987) and Mizuko and Reichle (1989) (See Table 2.2) investigated the learnability of PCS, using the paired associates paradigm. The participants were shown a page containing the target symbol and three foils. They were merely told which one of the four symbols presented was the symbol for the label.

Although PCS is one of the more iconic symbol sets (Mizuko, 1987; Mizuko & Reichle, 1989; Mirenda & Locke, 1989), Haupt (2001) found its iconicity ratings to be relatively low, between 2.8 and 11.1% (depending on the criterion used). Although PCS has no logical base for the expansion of vocabulary (Fuller, Lloyd & Stratton, 1997) AAC users could benefit from receiving a description or association to help them make a connection between the symbol and its label enhancing memory. It is, however, important to understand the experiential context of symbol learners to the learning process.

2.4 The impact of cultural factors on picture perception

A different definition of iconicity reveals the importance of considering other factors extrinsic to the symbol. This definition by Robinson and Griffith cited in Schlosser (2003) refers to the association that an individual forms between a symbol and its referent. According to them this association may be based on a recognized physical link between the symbol and its referent or any idiosyncratic association made by the viewer. This definition acknowledges that the relationship between a symbol and its referent is mediated by the learner.

According to Stephenson & Linfoot (1996) picture perception is an automatic activity that appears effortlessly in most young children. Children begin to name pictures in books to support their language development (Ninio & Bruner, 1978). Before picture recognition, naming and use can take place, the person must recognize that the pattern of lines on the surface of the piece of paper represents something (DeLoach, 1990; Deregowski, 1980). Then the person must be able to discriminate the figure in the picture from its background and only then he recognizes the picture as having a specific meaning (Stephenson & Linfoot, 1996).

The resemblance between an object and its picture can be seen as a characteristic determined by the observer rather than the characteristics intrinsic to the picture (Stephenson & Linfoot, 1996) and therefore judgments as to whether a symbol is iconic or not can only be made by the observer. Several factors such as the material on which the symbol is printed (Nadel, 1939, Deregowski, 1980, MacIntosh, 1977), schooling (Martlew & Connolly, 1996; Duncan, Gourlay, & Hudson, 1973) previous experience with symbols (Duncan et al., 1973; DeLoach, 1991; Miller, 1973) and cognitive style (Taylor, 1994; Taylor & Clarke, 1994) may influence the way in which an observer perceives a picture.

2.4.1 The material on which symbols are printed

The material on which symbols are printed seem to play an important role. Although Northern Nigerian boys were unable to identify familiar figures on paper, they could identify these same figures presented in carvings or on native leatherwork (Nadel, 1939). In a study by Deregowski, Muldrow, & Muldrow cited in Deregowski (1980), similar observations were made concerning the Ethiopian population which handled pictures on paper as flat objects although they could recognize pictures printed on known material.

2.4.2 Schooling

Martlew & Connolly (1996) collected human drawings from 287 schooled and unschooled children in remote Papua New Guinea with no history of cultural art. The results showed that school experience, even brief and indirect, had a significant effect on the drawings. Although this was a drawing task Martlew & Connolly (1996) stated that schooling helps children to develop skills in categorization, analysis and synthesis. Schooling further makes children aware of representation: that a sign/symbol can stand for something else and that other people can understand that symbol (Martlew & Connolly,

1996). Duncan et al. (1973) also found a positive correlation between pictorial perceptual ability and general scholastic ability.

2.4.3 Previous experience with symbols

Duncan et al. (1973) concluded that development of pictorial perception ability could be due to the influence of school (as stated above) or to extra-school cultural factors, or to both. These authors found a definite correlation between the ability of Bantu groups interpret to Western style pictorial material and the degree of acculturalation to western culture made. Groups acculturated more to Western mode will have had more experience with Western symbols.

2.4.4 Cognitive styles

Communication behavior and la nguage are based on certain cognitive styles (Taylor, 1994; Taylor & Clarke, 1994). One of the theories relating to cognitive style is Witkin's, cited in Taylor (1994), Taylor & Clarke (1994) and Retief (1988) concept of field-dependence and field-independence. According to these authors the way a person sees and thinks about the world around him will influence the way in which he sees and interprets a picture.

These four influences on picture perception are in turn influenced by a person's culture (Haupt, 2001). According to Taylor and Clarke (1994) "culture encompasses a set of behaviors, 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" (p 103). In a multi-cultural context such as South Africa it is very important to keep possible cultural differences in mind when working with or conducting research in diverse cultures.

2.5 Conclusion

Huer and Saenz (2002) mentioned that special attention should be given to possible cultural bias or preconceived points of view of the customs, beliefs, and practices of the group being studied and to sample sizes, procedures, protocols, translations and interpretations. The authors also mention that an additional consideration should be the relationship between the researcher's culture and that of the community being studied.

The participants in the current study are mother-tongue speakers of Afrikaans, a South African language developed mainly from Dutch after the Dutch had established a refreshment station at the

Cape in 1652 (Scholtz, 1970). Afrikaans thus has its roots in a Western culture and the previously mentioned factors would probably not influence picture perception. It is important to keep in mind that children growing up in Africa have different experiences to those of children growing up in European and North American countries, so that slight differences in picture perception can be expected. It is therefore important to obtain information from all language populations in South Africa.

According to Huer and Saenz (2002): 'there is a scarcity of data in the area of AAC services of relevance to culturally diverse populations; in particular, there is little in the way of empirical data that can support current clinical and educational practices' (p 267). Huer (2000) points to a lack of AAC research that incorporates participants from non-European American communities. Table 2.5 provides an overview of two international studies comparing cultural groups within the field of AAC.

TABLE 2.5 A summary of cross-cultural studies

Title, authors, year	Objectives	Symbols	Participants	Methodology	Results	Shortcomings and clinical recommendations.
Examining perceptions of graphic symbols across cultures: Preliminary study of the impact of culture / ethnicity. Huer, (2000).	• To examine the impact of culture / ethnicity on participants' perception of graphic symbols.	PCS DynaSyms Bliss	• 147 adults from comparable backgrounds, but different cultures: European American, African-American, Chinese, and Mexican.	• Comparable to Bloomberg et al., (1990) • All the labels were translated. • Participants had to rate translucency on a 7-point scale.	• Order of rankings the same across groups. • PCS most translucent, followed by DynaSyms and Bliss. • Ratings within symbols sets showed significant differences.	• Developers of AAC systems should take culture into account. • AAC symbols should be selected in consultation with users and families. • Participant selection as well as translation of labels are important issues. • Very important to assure equivalence of translated labels.
How do members of different languages compose sentences with a picture-based communication system? – A cross-cultural study of picture-based sentence construction by English and Japanese speakers. Nakamura, Newell, Alm & Waller, (1998)	• To determine the influence of word order and lack of particles on the performance of Japanese speakers when using graphic symbol sets that rely on English SVO word order.	PCS	<u>Experiment I</u> • 80 naïve Japanese university students • Proficient in spoken & written Japanese. • Mean age: 20.94 yrs. <u>Experiment II</u> • 43 students and staff of a university in Scotland. • Mean age: 28.2 yrs. • No knowledge of Japanese.	• P listened to Japanese folktale Experiment I • 40 answered 5 questions using PCS alone, 40 with PCS and added particle array. • half of the symbols were arranged in SVO order and half in SOV order. • Interview with P after experiment. <u>Experiment II</u> • almost identical; particle factor excluded	<u>Experiment I</u> • P used particles when available and reported difficulty when not available. • P produced more SOV than SVO sentences; no SVO sentences produced when particles were available. <u>Experiment II</u> • SVO order in both button order conditions.	• Particles should be added to graphic symbol sets, but may lower iconicity. • Add particles for users with adequate language ability. • In English, add prepositions and tense markers.

Huer's (2000) study investigated iconicity. Although African-American participants were used, they were all born and raised in America and therefore their results cannot be applied to cultures indigenous to Africa (Haupt & Alant, 2002). Although Haupt and Alant's study (2002) (See Table 2.2) did not compare two cultural groups, their study made an important cultural contribution through investigating the iconicity of PCS in an indigenous African culture. The purpose of their study was to investigate the iconicity of selected PCS for rural Zulu-speaking ten-year-olds. The participants were presented with copies of a commercially available matrix-36 communication overlay which they had to match to a symbol with a spoken isiZulu label. Each response had to be answered on a separate page.

As mentioned earlier, the results of the study by Haupt & Alant (2002) indicated a generally low average iconicity of between 2.8% (iconicity values = 75%) and 11.1% (iconicity values = 50%) for 36 symbols presented to the participants (Haupt & Alant, 2002). Only one symbol (symbol 11 []) was found to be iconic when the strict criterion was applied. With the application of the lenient criterion a further three symbols (symbols 12 [], 14 [] and 25 []) were found to be iconic. The results showed that this particular selection of symbols used by Haupt and Alant (2002) was largely non-iconic for the participants involved.

As Haupt (2001) studied the highest frequency responses for each symbol, she found that for some symbols a considerable number of participants agreed on a specific label, be it the target label or a non-target label. For other symbols either many possible labels were indicated, or none at all. Haupt (2001) coined the term 'distinctiveness' to describe how well-defined or specific the evoked meanings were that a symbol triggered in the mind of a viewer. As iconicity and distinctiveness are not opposing terms it allowed Haupt (2001) to distribute the symbols across four orthogonal groups: distinctive x more iconic; distinctive x less iconic; indistinctive x more iconic; and indistinctive x less iconic.

Haupt's results further suggest that the particular participants in her study did not make optimal use of the information afforded them by the arrows in symbols. They did not interpret the arrows as indicating movement. If they did interpret movement they did not utilize information about the direction of movement. Influences of the position of symbols on the overlay, the frequency of selection of symbols and the gender, on the results were insignificant (Haupt & Alant, 2002). They did not look into the learnability of the symbols. The present study aims to extend cultural specific data as well as looking into the learnability of PCS.

2.6 Summary

In this study the theoretical background on which the study is built, was discussed. Iconicity and learnability and the link between these variables were discussed. Different influences on picture perception and the importance for culture specific research were mentioned.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

In this chapter the methodology of the study is discussed. First the aims and the research design, and then the different phases of the study, including the preparation of material, translation of material, participant selection, are discussed. Next the execution and the results of the pilot study are discussed. The chapter concludes with an account of the data collection and analytic procedures.

3.2 Aims

3.2.1 Main aim

The main aim of this study was to determine how accurately typically developing urban, 6-year-old Afrikaans-speaking children could firstly, identify 16 PCS presented thematically on a commercially available communication overlay, and, secondly, recognize these symbols following exposure to a learning experience.

3.2.2 Sub-aims

The sub-aims for the current study were:

- To determine how accurately 6-year-old Afrikaans-speaking children were able to select the correct symbol in response to its spoken label.
- To randomly divide participants into an experimental and a control group and to expose the experimental group to a training session of the 16 symbols.
- To determine how accurately the experimental and control groups select the correct symbol in response to its spoken label following the training session.
- To compare the pre- and post-training data between groups, to see whether significant differences existed.

3.3 Research design

A quasi-experimental control group design (McMillan & Schumacher, 2001) was used between the two groups. Figure 3.1 gives a schematic presentation of the design used in the study.

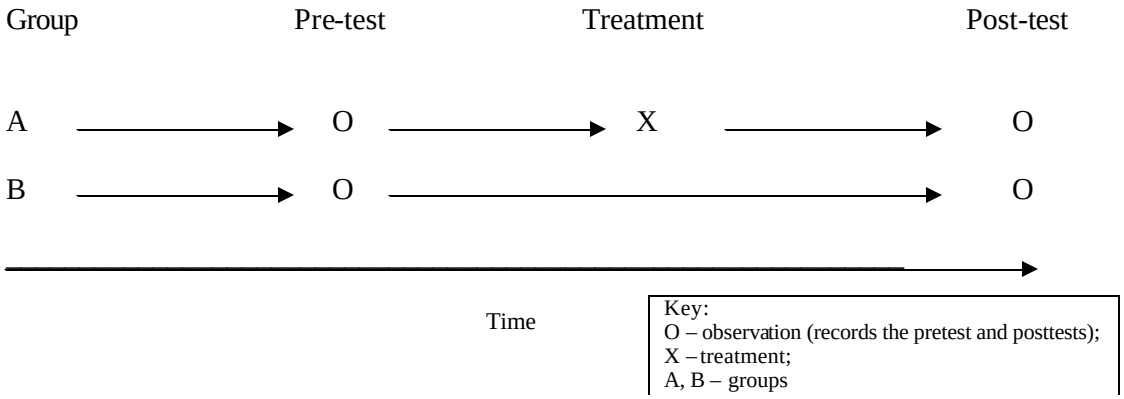


FIGURE 3.1 A schematic representation of the experimental design.

3.4 Phases of the study

The study was divided into two phases, the preparatory phase during which preparations essential for the execution the main study were done and the main study itself. Table 3.1 gives an overview of the two phases and what they entailed.

TABLE 3.1 Overview of the 2 phases of the study.

Phase one: Preparatory phase	• Obtaining permission from the Free State Department of Education in whose area the participants are located (See Appendices A & B) • Compiling consent forms, test overlay, pre-test, training overlay and training materials. • Translation of English phrases into Afrikaans. • Execution of a pilot study
Phase two: Main study	• The selection of participants. • Distribution and reception of consent forms. • Data collection in the form of a pre-test, a training session and a post-test. • Capture and statistical analyses of data • Interpretation of data. • Recommendations.

3.5 Development of material

The current study is partially based on a study by Haupt (2001; Haupt & Alant, 2002). In her study Haupt (2001) used a commercially available 36-matrix communication overlay to investigate the iconicity of 36 PCS symbols for a population of Zulu – speaking 10-year-olds. The symbols on the communication overlay used in Haupt's study were thematically organized around the bed-making theme.

The current study differs from Haupt's in three ways:

- Apart from iconicity learnability is also investigated.
- The populations of the two studies differ in age and culture.
- The current study utilizes a 16-matrix overlay.

3.5.1 Development of the overlays

During the study two overlays, the test overlay and the pre-test training overlay were used. The first step in developing the overlays was to establish the size of the matrix to be used in the study. This was the main aim of the pre-pilot conducted with a 5-year-10-months old female participant. It was assumed that if a slightly younger participant was able to perform the task, six-year-olds would also be able to do so.

The participant was given a booklet containing 6 pre-test training overlays and 36 test overlays. The pre-test training overlay (See Appendix C) consisted of 36 pictures, which included 10 pictures used on Haupt's training overlay and 26 pictures the researcher used during articulation therapy. The 36-matrix test overlay was a copy of the test overlay used in Haupt's study (See Appendix D).

The participant was first of all instructed to match the labels called out with the correct picture on the overlay. Each time she selected a symbol she was instructed to turn the page. Secondly, she was asked to name all the pictures on the pre-test training overlay. This was to make sure that the pictures were familiar.

Although the participant was able to perform the matching task with a 36-matrix pre-test training overlay, the 36-matrix PCS overlay proved to be overwhelming. The participant grew tired and said that the task was difficult.

It was decided to reduce the number of symbols on the overlay from 36 to 16. The researcher was unable to find a bed-making 16-matrix overlay among the overlays published by Elder and Goossens'. In order to keep with the bed-making theme it was decided to compile a 16-matrix bed-making overlay.

3.5.1.1 Compiling of the test-overlay

The steps taken to compile the test-overlay are shown in Table 3.2. (See final overlay in Appendix G).

TABLE 3.2 A description of steps taken to compile a 16-matrix bed-making overlay

Step 1	• Seven commercially available 16-matrix overlays were studied to determine which symbols were common to these overlays. • The three symbols 'let me'; 'no' and 'uh oh' were present on six of the seven displays studied and were placed in a pool of probable symbols to be used on the overlay.
Step 2	• Elder, P. S., & Goossens', C. (1996) developed 9-matrix commercially available overlays for moderately/severely developmentally delayed adolescents and adults. They developed two overlays organized around the bed-making theme: "Stripping bed" and "Making bed ". • The two overlays were compared to establish the symbols present on both overlays. • The symbols 'What a mess!'; 'Help me, please'; 'Need to pull it'; and 'Let's get the bed made' were present on both and placed in the pool. • This meant that 7 symbols were in the pool; the 3 symbols on the 16-matrix overlays and the 4 symbols present on both 9-matrix overlays.
Step 3	• The following 10 symbols were left on the two 9-matrix overlays: 'They're dirty.'; 'Need to change them.' 'Let's take it off.; 'Put it in the hamper.'; 'Thank you'; It's crooked.'; 'Have to fold it back.'; 'Got to tuck it in.'; 'Let's put it on…' and 'Looks good.' • All the above-mentioned symbols put together amount to 17 symbols, one more than required.
Step 4	• All 17 symbols were translated (See 3.5.2).
Step 5	• During the translation process (See 3.5.2), the translators were unable to reach consensus about the term 'Let's put it on…'. • 'Let's put it on…' was removed from the pool and the remaining 16 symbols were placed on the communication overlay.
Step 6	• After the translation was completed, the Afrikaans words were discussed with a grade R teacher at the pilot school. She felt that grade R learners would know the symbol concepts, and that they would probably be able to identify some of the symbols.
Step 7	• The 36-matrix overlay was used to guide the researcher in the placement of the symbols on the overlay.
Step 8	• The order of presentation during the test procedure was selected randomly. The symbols were collected in a hat and the order drawn.

3.5.1.2 Compiling of the pre-test training overlay

The purpose of the pre-test training overlay was to explain the matching task to the participants. They were also given the opportunity to practise the task. It was important that the participants be familiar with the pictures used on the overlay. During the second phase of the pre-pilot the participant named the pictures on the 36- matrix pretest training overlay. Eight of the pictures could have had more than one label, and as this could be confusing, these pictures were removed from the pool of possible pictures. The 10 pictures used by Haupt (2001) were used and a further 6 pictures were drawn. The order of presentation on the pre-test overlay as well as the order of presentation during the test procedure was randomly drawn from a hat (See the pre-test training overlay in Appendix H).

3.5.2 Translation

The material used for the pre- and post-tests were translated from the original English into Afrikaans. A combination of back translation, the committee approach and pre-test procedures (Brislin, 1980; Haupt, 2001; Retief, 1988) was followed.

Six translators were used to translate the words and phrases into Afrikaans. They were all familiar with both languages and had previously translated different items between the two languages. One translator is a mother-tongue speaker of English, while the other five are Afrikaans mother-tongue speakers. Table 3.3 presents the background information on the first translators, while Table 3.4 profiles the second translators. Unfortunately, due to unforeseen circumstances, two of the translators, A3 and E1, were unable to take part in the consensus meetings

TABLE 3.3 Background information on 1st translators

	A1	A2	A3
Qualification	MA (English)	B.A. –Ed (with languages)	B.A. (Main subjects: Afrikaans-Nederlands; Psychology
Occupation	Teacher	Teacher	Teacher
Time in occupation	34 years	17 years	3 years
Mother-tongue	Afrikaans	Afrikaans	English
Other languages	English	English	Afrikaans
Translation from English to Afrikaans		- Letters for the principal - References - Circular letters	- Items for school - Worked at bilingual regional paper: translation part of duties - Private translation
Translation from Afrikaans to English	- M.A. – thesis (Psychology) - Constitution of two institutions - Newsletters	- Letters - Circular letters - References	- Items for school - Worked at bilingual regional paper: translation part of duties. - Private translation

TABLE 3.4 Background information on 2nd translators

	E1	E2	E3
Qualification	B.A. Communication Studies (Honours)	B.A. T.O.D. –Combined Diploma	B.A., B Ed. SDKR
Occupation	Media- and Marketing Manager Previously: Journalist	Teacher	Principal education specialist
Time in occupation	4 years 7 years	22 years	22 years
Mother-tongue	Afrikaans	Afrikaans	Afrikaans
Other languages	English	English and German	English
Translation from English to Afrikaans	Daily translations of press releases from English to Afrikaans		- Thesis - Lectures
Translation from Afrikaans to English	Daily translations of press releases from Afrikaans to English	-1 B.A. Honours Geography -4 B.Arch. Thesis -1 M.A. Geography dissertation	- Thesis - Lectures

The first translators were given the 17 words / phrases to translate on their own. The PCS symbols used in the study can be used in more situations than just in the bed-making theme. To keep the translations as neutral as possible, the translators did not have access to each other or the pictures. The researcher compared the translations and found differences. An appointment was made between translator A1 and A2. They were provided with all three translations as well as with a copy of the symbols. After they had discussed the results they reached consensus (See Appendix I).

The translated words / phrases were then given to the three 2nd translators. They translated the phrases back into English. They did not have access to each other or the pictures. The researcher compared the translations with each other as well as with the original text. Several differences were found (See Appendix J).

A meeting was arranged between translator E2, translator E3 and the researcher. During their discussion they had a copy of the original English, the Afrikaans translation, the three English translations and the symbols. Although the symbols can also be used in other situations, it was important that the association between the symbol and its label made sense within the bed-making context. The use and translation of the English words need, must and should were discussed. Need, used in the original text, as well as must can both be translated into "moet" in Afrikaans, should is the translation of "moes" the past tense of the word "moet". The translators felt that a shift in emphasis would lead to different translations at different times.

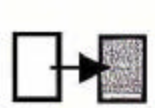
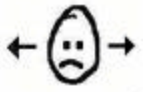
The label "let's put it on" caused difficulty as it could have slightly different meanings, which did not make sense within the context. As mentioned in Table 3.2, it was decided to exclude this symbol from the study.

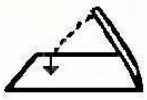
Although their back translations differed from the original text, the translators felt that the Afrikaans translations were correct in all but two cases. Two changes were made to the Afrikaans translation in order to be clearer in accordance with the symbols and theme to be used (See the final consensus in Appendix K).

3.5.3 Compiling of teaching material

The training material consisted of the test overlay and 16 A4 flash cards, with one symbol on each. The flash cards consist of enlarged copies of the 16 symbols. These copies were placed on A4 folios (See Appendix L for an example of the flashcards). The symbols, their labels and the explanations used during training are presented in Table 3.5 (See Appendix S for the verbatim Afrikaans explanations used in the study). A pre-school teacher from the pilot school judged the explanations favourably.

TABLE 3.5 A presentation of the symbols, their labels and explanations.

Symbol	Label	Explanation
	1 Let me.	This picture means: LET ME. Look, he points to himself and says: “LET ME.”
	2 Let’s take this off.	This picture means: LET’S TAKE THIS OFF. Look, he is taking off his hat and says: “LET’S TAKE THIS OFF.”
	3 Need to change them.	This picture means: NEED TO CHANGE THEM. Look, it changes. “NEED TO CHANGE THEM.”
	4 It’s crooked.	This picture means: IT’S CROOKED. Look one of the sticks is crooked: “IT’S CROOKED.”
	5 No,	This picture means: NO Look, the man shakes his head and says: “NO.”
	6 Let’s get the bed made.	This picture means: LET’S GET THE BED MADE. Look, he is making his bed and says: “LET’S GET THE BED MADE.”
	7 Looks good.	This picture means: LOOKS GOOD. Look, the hand shows: “LOOKS GOOD.”
	8 Got to tuck it in.	This picture means: GOT TO TUCK IT IN. Look, the arrow points inside: “ GOT TO TUCK IT IN.”

	9 Uh oh.	This picture means: UH-OH. Look, he widens his eyes and mouth and says: "UH-OH."
	10 Need to pull it.	This picture means: NEED TO PULL IT. Look, he is pulling the rock and says: "NEED TO PULL IT."
	11 They're dirty .	This picture means: THEY'RE DIRTY. Look at the dirty spots: "THEY'RE DIRTY.
	12 What a mess!	This picture means: WHAT A MESS! Look, somebody overturned the paint: "WHAT A MESS!"
	13 Thank you.	This picture means: THANK YOU. Look, the man points with his hands: "THANK YOU."
	14 Help me please.	This picture means: HELP ME, PLEASE. Look, the one hand helps the other hand: "HELP ME, PLEASE."
	15 Have to fold it back.	This picture means: HAVE TO FOLD IT BACK. Look, they fold back the page: "HAVE TO FOLD IT BACK."
	16 Put it in the hamper.	This picture means: PUT IT IN THE HAMPER. Look, all the washing is in the hamper: "PUT IT IN THE HAMPER."

3.6 Pilot study

A pilot study was conducted to ensure the feasibility of the planned data collection as well as the suitability of the test material and the test protocol (Haupt, 2001; McMillan & Schumacher, 2001).

3.6.1 Participants

A school in a nearby town, familiar to the researcher and willing to participate, was used for the pilot study. A group of 16 participants was chosen using the same selection criteria as for the main study. Two of the participants, one in each group, were not yet 6 years old (participants 6 and 14). The researcher decided to use these participants in the pilot study in order to investigate one of the pilot study objectives, namely the number of participants per group.

The group of learners was randomly divided into two groups. Each group consisted of 4 boys and 4 girls. The mean chronological age was 74 months (6 years 2 months) for the whole group as well as for the individual groups. A distribution of the participants across gender and age (months) is presented in Table 3.6. Participants 1-8 underwent the pre-and post-test procedures as well the training session, while participants 9-18 underwent only the two testing procedures.

TABLE 3.6 Description of pilot study participants.

Participant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Gender	M	M	F	M	F	F	M	F	F	M	M	M	M	F	F	F
Age	78	77	77	74	72	71	75	72	72	74	77	73	76	71	75	76

3.6.2 Pilot study objectives, results and recommendations

The objectives, results and recommendations of the pilot study are presented in Table 3.7.

TABLE 3.7 Pilot study objectives, results and recommendations.

	Objective	Discussion and results	Recommendations
Test Material 1 Training overlay	1 • To determine whether participants know pictures.	1 • Pre-test = 99% ;Post-test = 98%; (participant 9 had 4 out of 8 wrong during post-test.).	1 • Keep training overlay the same.
2 Overlay	2 • To determine whether overlay is reasonable. • To determine whether number of symbols on overlay is sufficient.	2 • Participants were able to go through all the symbols; they did not seem to find them overwhelming. Considering the final results of the pilot study it can be assumed that the overlay is effective.	2 • No changes needed.
3 Translation	3 • To determine whether labels	3 • A grade R teacher was asked to judge the labels. She found all of them to be clear and familiar	3 • No changes needed
Test protocol 1 Instructions	1 • To determine whether the instructions are clear.	1 • Participants understood and followed the instructions. • The researcher was unable to control the groups while giving instructions, so she had to make extra comments not in the test protocol in order to get the participants under control.	1 • A research assistant was appointed to help control the participants. This was successfully tested on day 3. • A few small changes in the instructio were made.
2 Seating arrangements	2 • To determine how to seat participants to avoid copying.	2 • On day 1, participants copied from each other. The seating arrangements were changed on day 3 and proved to be successful	2 • Seating arrangements might differ frc school to school (depending on furnit available); so the researcher had to tr keep the arrangement as similar as possible, but most important, participants must not be able to copy.

Subjects 1 Selection criteria	1 • To determine whether certain selection criteria would not eliminate participants unnecessarily.	1 • 50 % of the parental forms were returned. 25 % of these participants were bilingual. Demanding an Afrikaans only home environment might exclude participants. • Of the 16 participants in the pilot study 4 were enrolled in a pre-school for the first time in January 2003. According to the criteria demanding a year in a pres-school environment these participants would be excluded from the study.	1 • Change the criteria from both parents Afrikaans - speaking, to one parent Afrikaans - speaking. • Change the criteria from a year in a pre-school environment, to enrollment at the beginning of the current school year (about 5 months).
2 Group size	2 • To determine whether researcher would be able to handle a group of 8 participants.	2 • The researcher was unable to handle a group of 8 by herself. She was not able to ensure participants paging 1 page at a time and only marking one symbol at a time.	2 • Research assistant was appointed. • The corners of the test booklets folded to assist the participants with the turning of pages • Pages numbered to assist researcher and research assistant to ensure that participants are on the correct page.
3 Sampling	3 • To determine how to select participants.	3 • Sampling went well	
Training protocol	1 • To determine whether explanations given during learning session were clear .	1 • The experimental group's results from the post-test showed an improvement, namely from 33.03% to 82.8% correct.	1 • No changes needed

3.6.3. Research assistant

A research assistant was appointed to assist the researcher. Her duties were to ensure that the participants marked one symbol per page, paged one page at a time and not did copy from one another. The research assistant was a retired foundation phase teacher.

3.7 Participants

The participants in the current study were typically developing 6-year-old Afrikaans-speaking children living in the northern part of the Free State province of South Africa.

The Free State is the province with the second smallest population in South Africa (Orkin, 1998). At least 69% of the province's population lives in urban areas (Orkin, 1998). Afrikaans is the home language spoken by 14.5% of the province's population, second to Sesotho (Orkin, 1998), which is spoken by 62.1% of the population.

3.7.1 Selection criteria

Table 3.8 gives an outline of the selection criteria used to select the participants (Ps). Most of the information was obtained from the questionnaires completed by the parents, and also from the teachers' reports.

TABLE 3.8 Selection criteria

Selection criteria	Determination of passing criteria	Reason for criteria
1 Age: 6:00 – 6:11.	Each participant's(P's) age was calculated using the birth date received from parent and teacher reports.	Visual perception increases with age (Duncan et al., 1973). It is important that participants form a homogeneous group with more or less the same visual perceptual level.
2 No apparent learning problems.	Teacher report.	It is important to ensure that all Ps are able to learn without additional support.
3 No developmental delay.	• Teacher report. • Parent report: No Speech, Occupational or Physiotherapy	Developmental delay could negatively influence performance.
4 Attendance of pre-school since start of 2003.	Teacher report.	To make sure Ps had similar learning experiences and exposure to pictures.
5 Afrikaans as a significant language in the home environment.	Parent report.	The test and training were presented in Afrikaans and all participants should be familiar with Afrikaans.
6 Afrikaans as language of instruction.	Teacher report.	Test and training presented in Afrikaans.
7 Sensory acuity: - no hearing loss - no uncorrected sight problems	Parent and teacher report.	To ensure that Ps had no hearing or sight problems that could interfere with results of the study
8 No previous exposure to PCS.	• Teacher report. • Interview with speech therapists in area.	To ensure that Ps had no previous exposure with PCS, which could have an influence on results

3.7.2 Description of schools and participants

A list of pre-schools in the particular district was obtained from the First Education Specialist (FES) for Early Childhood Development (ECD). The pool of schools consisted of 7 schools with Afrikaans as language of instruction. Six schools in close proximity were approached and four agreed to participate in the study. Forty-six learners (25 girls and 21 boys) who met the requirements of the selection criteria, took part in the study. Their mean chronological age was 75.59 moths (See Table 3.8 for overview of the participants and their schools).

TABLE 3.9. Overview of schools (n=4) and participants(n=46)

Schools	Number of consent forms distributed	Total number of participants	Experimental group	Control group
A	15	13	7	6
B	20	12	6	6
C	40	6	3	3
D	40	15	8	7

3.8 Material and equipment

Table 3.10 gives an overview of the material used during the data collection procedures of the main study

TABLE 3.10 Material and equipment

Material	Explanation
Information letter and consent form to principal	• Principals of the schools were given information about the study as well as the opportunity to decide whether or not their learners would participate in the study. (See Appendix E for a copy of the letter.)
Consent forms and questionnaires to parents	• Parents were given relevant information about the study, as well as the opportunity to decide whether or not their child would be allowed participate in the study. • Information obtained through the questionnaire was used as descriptive criteria. (See Appendix F for a copy of the consent form and questionnaire.)
Test booklet	• Each participant received a recording booklet containing eight pre-test training and sixteen test overlays. • The pre-test training overlay consisted of sixteen line drawings known to 6-year olds. The training overlay was used to train the children in the task at hand and as a screening tool. (See Appendix H for a copy of the pre-test training overlay .) • The test overlay contained a 16 matrix overlay designed by the researcher working from examples of other 16 matrix and 36 matrix overlays designed by Elder and Goossens' (1996). (See Appendix G for a copy of the test overlay.)
Afrikaans phrases	• To be used according to protocol. These phrases were translated from the original English and tested during the pilot study.
Training material	• Script with explanations of PCS symbols. • A4 flash cards of symbols, with one symbol per flash card. • One communication overlay to be handed in after teaching session.
Reward tokens	• Participants were given stars as a reward after the pre- and post-testing to thank them for participating.
Markers	• Each participant was given a marker to indicate his/her choices on the overlays.
Panasonic RQ-2102 Portable Cassette Recorder; double-adaptor, batteries and audio-tapes.	• To tape pre-test, post-test and training sessions, for determining the consistency of instructions given across sessions.

3.9 Procedures

In this section the procedures followed during the execution of the main study will be discussed in detail. For the purpose of this discussion the procedure will be divided into two stages. Four schools participated in the final study. First of all each school's participants were divided into cohorts. Each cohort had a maximum of 8 participants and both the pre- and post-test procedures were done in these cohorts. On the second day the cohorts were sub-divided into experimental and control groups. Each cohort was thus represented by experimental and control participants. (See Figure 3.2 for a schematic representation of the procedures.)

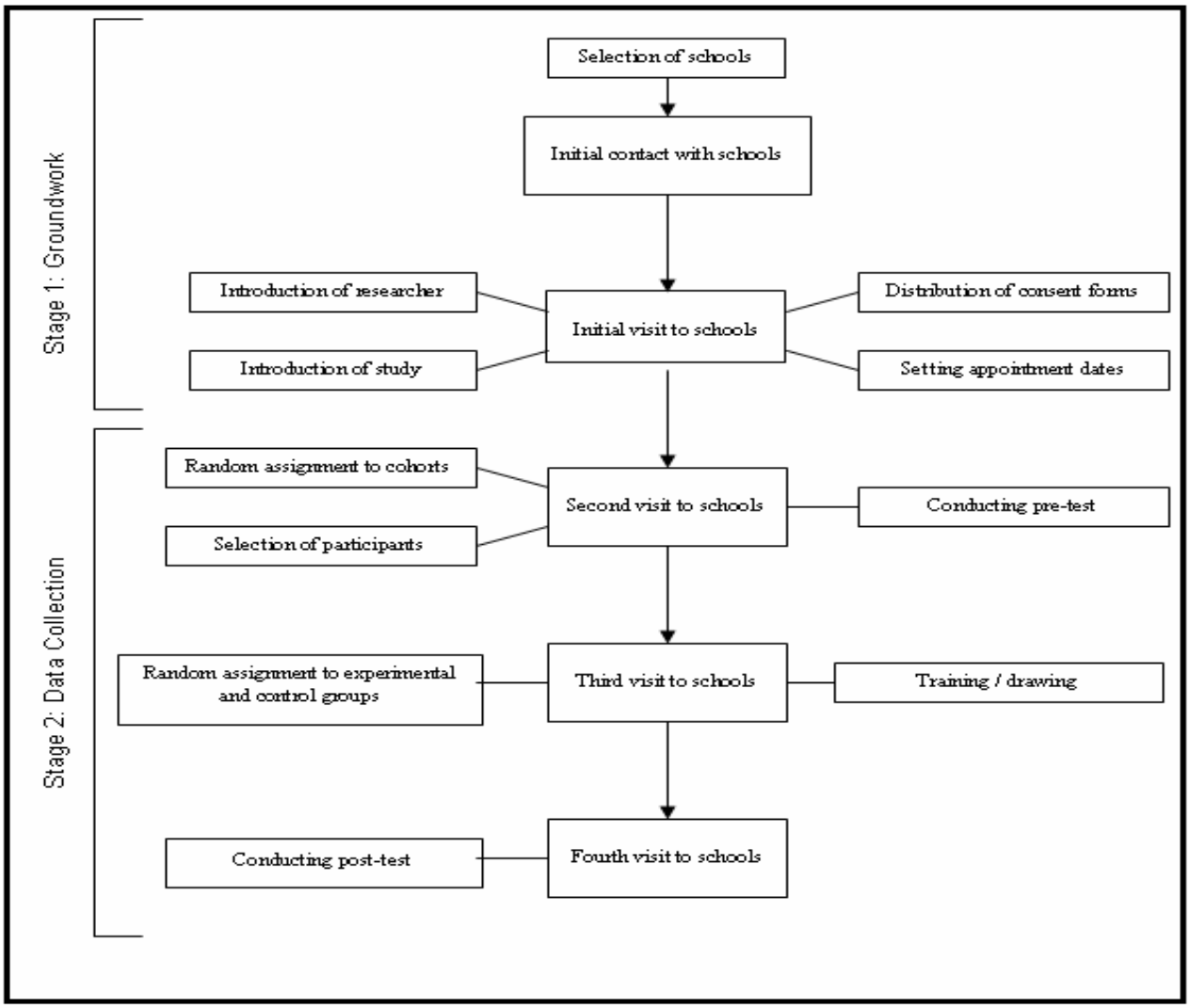


FIGURE 3.2 Procedures followed during the main study

3.9.1 Stage 1

The final groundwork for the study was done during stage 1. Schools were selected and contact was established by telephone. During this initial contact an appointment was made for the introduction of the researcher and study. These meetings were held at the respective schools. At the meetings the study was briefly explained and the selection criteria presented. The schools were provided with a copy of the permission letter received from the Free State Department of Education (See Appendix B for a copy of this letter). It was made clear that they were under no obligation to participate in the study. If they elected to participate in the study, the principal received a letter explaining the study and a consent form (See Appendix E) to complete. They also received the letters and consent forms to be distributed to the parents/guardians (See Appendix F). The venue and the furniture needed was also discussed.

3.9.2 Stage 2

This stage consisted of the selection of participants and the actual data collection and was done within a 1 ½ month period from 9 June – 18 July 2003. Each school was visited three times on consecutive days. Table 3.11 presents the visit schedule.

TABLE 3.11 A presentation of the visit schedule.

School	Day 1: pre-test.	Day 2: training.	Day 3; post-test
A	09/06/2003	10/06/2003	11/06/2003
B	10/06/2003	11/06/2003	12/06/2003
C	16/07/2003	17/07/2003	18/07/2003
D	16/07/2003	17/07/2003	18/07/2003

3.9.2.1 Division of participants into groups

The 46 participants were divided into two cohorts, which stayed the same for the pre- and post-test, but the participants were divided into experimental and control groups on day 2. (See Figure 3.3 for A schematic presentation of the groups).

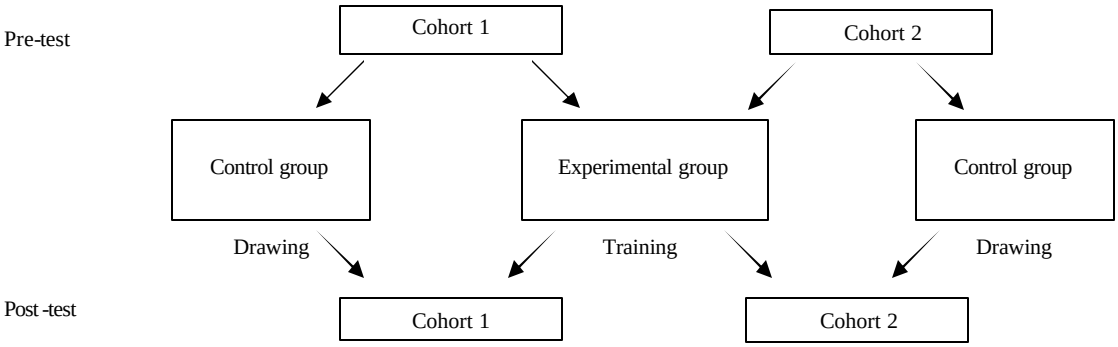


FIGURE 3.3 A schematic presentation of the division of participants at schools.

3.9.2.2 Day 1

On arriving at the school the researcher and research assistant set up the room for the test situation. Schools A and C provided libraries, school B an empty classroom and school C the computer room.

- The furniture was arranged. A maximum of eight participants could be tested at a time. They were seated two at a table facing each other. Identical boxes were stacked between them to prevent copying (See Appendix M for plans of the rooms).
- A booklet, a blank page and a marker were placed at each seat.
- The participants were selected and divided into groups as discussed earlier.

a) Pretest - training procedure for testing

- Researcher greeted the participants.
- Participants were shown where to sit.
- Participants sat down and were instructed to leave material alone.
- Each participant was assigned a number to ensure that pre- and post-test data could be linked.
- To control procedural consistency between different sessions, all sessions were audio-recorded. The tape recorder was switched on at this point.
- The introduction according to the test procedure was given (See Appendix N for the verbatim Afrikaans and Appendix O for the English translation).
- Table 3.12 shows the procedures which were followed.

TABLE 3.12 Procedures followed for introduction and pre-test training

Introduction	• *Today we are going to play a game with words and pictures. Before we begin I want you to show me if you know how to draw a cross. Let us try. That is right, draw a line like this and another line like that (Researcher [R] demonstrates on a page), take the cap off the pen and practise making a few on the separate page (Participants[Ps] practise on a separate page).* • *That is very good, put the cap back on the pen and put th e pen down.*
Instructions	• *Together with your page and pen you also received a book. Let us look at the first page of the book. I want you to look at each picture on the page. You must point with your finger as you look at the pictures (R demon-strates). You must look carefully. Look at all the pictures. (Ps have about a minute to look at the pictures).* • *Finished! Take the cap off your pen and place it on the back of the pen. Leave it there until we are finished. You will see that the corners of the pages of the book are folded over. This is to help you to page one page at a time. You must turn only one page at a time and only when I've said: that's fine".*
Pre-test training	• *Now you have to listen carefully, I am going to say a word, then you have to look at all the pictures on the page and decide which picture matches the word I've said. Draw a cross over the one you think matches. I will help you with the first one:* • *The first word is **umbrella.** Now I take a look at all the pictures (R looks at all the pictures, she tracks with her finger to demonstrate looking at all the pictures). I think this one belongs with the word umbrella and I draw a cross over it. Point to the picture and draw a cross over it. If I say that is fine, you must draw your cross and turn the page. Are you all finished? That's fine, turn the page.* ***2 chair*** *That's fine, turn the page.* ***3 mouse*** *That's fine, turn the page.* *Now you must try it on your own:* ***4 tap*** *That's fine, turn the page.* ***5 ball*** *That's fine, turn the page.* ***6 ice-cream*** *That's fine, turn the page.* ***7 eyes*** *That's fine, turn the page.* ***8 scissors*** *That's fine, turn the page.*

- The researcher and research assistant were allowed to assist a participant if he/she seemed unsure of what to do. This assistance was done by pointing to each picture or taking the participant's finger and to facilitate the scanning.
- The researcher and research assistant ensured that participants chose one picture per page, paged one page a time and did not copy from each other.

b) Pre-test - testing procedure

- The Afrikaans can be found in Appendix P (See Appendix Q for the English translation).
- The researcher and research assistant ensured that participants chose one picture per page, paged one page a time and did not copy from each other.
- Table 3.13 presents the procedures which were followed.

TABLE 3.13. Procedures followed for testing

Introduction of overlay	• *That's good. Now we are going to look at this new page. Here we have different pictures. I want you to look at all these pictures. You must point to the pictures as you look at them. Do not write anything before I tell you to. (Ps have about a minute to look at the pictures).* *These pictures are different from the previous pictures. This time I want each of you to work on your own. You must look carefully before deciding which picture belongs to the word that I said. There is no correct or incorrect answer, you have to decide which picture you think belongs to the word I said.*
Instructions	• *If you see the picture that matches the word, please draw a cross over it and wait until I tell you to turn the page. If you think a picture belongs to more than one word, you can choose it more than once. Remember: you will have to listen and look carefully b efore you choose.* *I will say each word three times before you will turn the page. Let us get started. The first one:*
Test procedure	***1(9) Let me. (x3)*** *That's fine, turn the page.* ***2(10) Thank you. (x3)*** *That's fine, turn the page.* ***3(11) Need to pull it. (x3)*** *That's fine, turn the page.* ***4(12) Put it in the hamper. (x3)*** *That's fine, turn the page.* ***5(13) Let's take this off. (x3)*** *That's fine, turn the page.* ***6(14) Have to fold it back. (x3)*** *That's fine, turn the page.* ***7(15) It's crooked. (x3)*** *That's fine, turn the page.* ***8(16) Need to change them. (x3)*** *That's fine, turn the page.* ***9(17) Got to tuck it in. (x3)*** *That's fine, turn the page.* ***10(18) They're dirty. (x3)*** *That's fine, turn the page.* ***11(19) Uh-oh. (x3)*** *That's fine, turn the page.* ***12(20) Looks good. (x3)*** *That's fine, turn the page.* ***13(21) No. (x3)*** *That's fine, turn the page.* ***14(22) Help me, please. (x3)*** *That's fine, turn the page.* ***15(23). What a mess! (x3)*** *That's fine, turn the page.* ***16(24) Let's get the bed made. (x3)*** *That's fine, turn the page.*
Closure	*There we go. Now we are finished. Thank you your cooperation. You can place the cap back on the pen.*

- At schools A, B and D the procedure was repeated with the next cohort.

3.9.2.3 Day 2

a) Training

- The researcher prepared the venue.
- Participants were seated at one table facing the researcher (See Appendix R for a plan of the set-up).
- Each participant received a copy of the test overlay.
- Particpants were divided into groups as explained earlier.
- Participants in the experimental group were brought to the venue.
- They took their seats.
- To control for procedural consistency between the different sessions, all sessions were audio-recorded. The tape recorder was switched on at this point.
- The Afrikaans can be found in Appendix S (See Appendix T for the English translation).
- Table 3.14 presents the procedures which were followed.
- The participants in the experimental group followed with their fingers on the test overlays in front of them.
- This procedure was repeated.
- The second time around the experimental group was allowed to repeat the meaning with the researcher.
- The control group was taken to the venue.
- Each participant in the control group received a blank page and a pencil.
- They were told that they were not going to do the same as the other children, but that they could draw a picture of anything they wanted to.

TABLE 3.14 Procedures followed during training

Introduction	• *Today I am going to tell you the meaning of the pictures we played with yesterday.* • *Each of you have a page with the pictures we used. (Each participant [P] receives a copy of the grid.)* • *I have big pictures. Let us have a look. (The R has 16 A4 sized flashcards, each containing one of the symbols. The symbols are explained in the grid order from left to right, top to bottom.) You can point to the symbols on the page in front of you.*
Explanations	*1 This picture means:* ***LET ME.*** *Look, he points to himself and says:* ***"LET ME."*** *2 This picture means:* ***LET'S TAKE THIS OFF.*** *Look, he is taking off his hat and says:* ***"LET'S TAKE THIS OFF."*** *3. This picture means:* ***NEED TO CHANGE THEM.*** *Look, it changed: "****NEED TO CHANGE THEM."*** *4 This picture means:* ***IT'S CROOKED.*** *Look one of the sticks is crooked:* ***"IT'S CROOKED."*** *5. This picture means:* ***NO*** *Look, the man shakes his head and says:* ***"NO."*** *6 This picture means:* ***LET'S GET THE BED MADE.*** *Look, he is making his bed and says:* ***"LET'S GET THE BED MADE."*** *7 This picture means:* ***LOOKS GOOD.*** *Look, the hand shows:* ***"LOOKS GOOD."*** *8 This picture means:* ***GOT TO TUCK IT IN.*** *Look, the arrow points inside:* ***" GOT TO TUCK IT IN."*** *9. This picture means:* ***UH-OH.*** *Look, he widens his eyes and mouth and says:* ***"UH-OH."*** *10 This picture means:* ***NEED TO PULL IT.*** *Look, he is pulling the rock and says:* ***"NEED TO PULL IT."*** *11 This picture means:* ***THEY'RE DIRTY.*** *Look at the dirty spots:* ***"THEY'RE DIRTY.*** *12 This picture means:* ***WHAT A MESS!*** *Look, somebody overturned the paint:* ***"WHAT A MESS!"*** *13 This picture means:* ***THANK YOU.*** *Look, the man shows with his hands:* ***"THANK YOU."****.* *14 This picture means:* ***HELP ME, PLEASE.*** *Look, the one hand helps the other hand:* ***"HELP ME, PLEASE."*** *15 This picture means:* ***HAVE TO FOLD IT BACK.*** *Look, they fold back the page:* ***"HAVE TO FOLD IT BACK."*** *16 This picture means:* ***PUT IT IN THE HAMPER.*** *Look, all the washing is in the hamper:* ***"PUT IT IN THE HAMPER."*** *Well done, let's go through them one more time. You can repeat them with me.*
Closure	*Well done, now we have finished. You can go now. Please leave the pages on the table.*

3.9.2.4 Day 3

a) Post-test

- On arriving at the school, the venue was set up in the same way as on day 1.
- The participants were shown to their places (the same places as on day 1) and their participant numbers were checked.
- To control for procedural consistency between the different sessions, all sessions were audio-recorded. The tape recorder was switched on at this point.
- See Apppendix U for Afrikaans and see Appendix V for English translations.
- Table 3.15 presents the procedures which were followed.

TABLE 3.15 Procedures followed during post-testing

Introduction	*Today we are going to play the game we played on Monday/Tuesday/ Wednesday. Can you still remember? Let's practise with the first pictures. Look at the pictures once more. You must point with your finger as you look at the pictures. You must remember to look carefully. Look at all the pictures. (The Ps have about a minute to look at the pictures).*
Pre-test training	*Finished! Take the cap of your pen and place it on the back. Leave it there until we are finished. Now you have to listen carefully, I am going to say a word, look at all the pictures on the page and decide which picture matches the word I said. Draw a cross over the one you think matches.*
Instructions	• *You must look carefully before deciding which picture belongs to the word that I said. You must each decide on your own and not let the others see your work. You must decide which picture belongs to the word I've said.* • *If you see the picture that belongs to the word, please mark it with a cross and wait until I say you can turn the page. Remember that you will have to listen and look carefully before you choose.* • *I will say each word three times before we will turn the page. Let's get started.* • *The first one* ***1(9) Let me (x3)*** *That's fine, turn the page.* ***2(10) Thank you. (x3)*** *That's fine, turn the page.* ***3(11) Need to pull it. (x3)*** *That's fine, turn the page.* ***4(12) Put it in the hamper. (x3)*** *That's fine, turn the page.* .

	5(13) Let's take this off. (x3) *That's fine, turn the page.* ***6(14) Have to fold it back. (x3)*** *That's fine, turn the page.* ***7(15) It's crooked. (x3)*** *That's fine, turn the page.* ***8(16). Need to change them. (x3)*** *That's fine, turn the page.* ***9(17). Got to tuck it in. (x3)*** *That's fine, turn the page.* ***10(18) They're dirty. (x3)*** *That's fine, turn the page* ***11(19) uh oh (x3)*** *That's fine, turn the page.* ***12(20) Looks good. (x3)*** *That's fine, turn the page.* ***13(21) No (x3)*** *That's fine, turn the page.* ***14(22). Help me, please. (x3)*** *That's fine, turn the page.* ***15(23) What a mess! (x3)*** *That's fine, turn the page.* ***16(24) Let's get the bed made. (x3)*** *That's fine, turn the page.*
Closure	*There we go. Now we are finished. Thank you your cooperation. You can place the cap back on the pen.*

3.10 Analysis of data

Correct responses were recorded and checked by the researcher. The scores were double-checked by a second person. The data was captured using Microsoft Excel 2000, tchecked to eliminate typing and transfer errors, analyzed with the help of a statistician from the Department of Statistics at the University of Pretoria. The statistical packages used were SAS and BMDP. Table 3.16 gives a brief overview of the data and the procedures used to analyze it.

TABLE 3.16 The procedures used to analyze data.

Description of data	Statistical procedure that could be used
Comparison between the experimental and comparison group to ensure homogeneity.	Comparison of group ages: Mann-Whitney (Steyn, Smith & du Toit, 1989). Comparison of pre-test results between experimental and control groups: Mann-Whitney (Steyn, Smith & du Toit, 1989).
Number of correct responses.	Descriptive statistics: frequency distribution / histograms could give a picture of the group. The mean of correct responses across symbols and standard deviations.
Experimental group: comparison of pre- and post-test results.	Wilcoxon (Steyn, Smith & du Toit, 1989).
Control group: comparison of pre- and post-test results.	Wilcoxon (Steyn, Smith & du Toit, 1989).
Error analysis	Descriptive statistics: frequency distributions.

3.11 Summary

In this chapter the methodology of the study was discussed. The aims and sub-aims were stated. A brief overview was given of the research design as well as the data collection and analyses. The phases of the study, the pilot study and recommendations were also discussed.

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Introduction

In this chapter the results of the study are described and discussed according to the aims mentioned in the previous chapter. The discussion begins with the presentation of the occurrence of missing data. Next the pre-test data for both the experimental and control groups are presented and discussed. This is followed by the presentation of the post-test data for both groups. The learnability data will be discussed next. Finally, a comparison between the data with the data from this study and that of Haupt and Alant (2002) follows.

4.2 Missing data

There were three sources of missing data: faulty page turns, no symbol indicated and deviations in indicating choice. The missing data will be presented according to the experimental and control groups and not according to the cohorts. Tables 4.1 and 4.2 present the missing data of the experimental and control groups respectively.

TABLE 4.1 Experimental group: Missing data from 5 participants

Sources of missing data	Frequency	No. of responses	Pre-test	Post-test
Faulty page turns	1	1	1	-
No symbols indicated	1	1	-	1
Deviations	5	5	4	1
			5	2

TABLE 4.2 Control group: Missing data from 2 participants

Sources of missing data	Frequency	No. of responses	Pre-test	Post-test
Faulty page turns	-	-	-	-
No symbols indicated	2	2	1	1
Deviations	-	-	-	-
			1	1

From the above-mentioned tables it is evident that during the experimental group's pre-test procedures five responses were missing, four resulting from deviations in indicating choice and one because of a faulty page turn. During the post-test procedures two responses were missing due to no symbol indicated and a deviation in indicating choice. During the control group's procedures two responses were missing, one each during the pre- and post-test respectively. Both these missing responses were due to no symbol indicated. Of a total of 1472 possible responses nine could not be used in analysis. The missing data can be regarded as negligible (See Appendices Y to AA for missing data).

4.3 Presentation of pre-test results

The first sub-aim of the current study was to determine how accurately the participants would select the correct symbol in response to its spoken label (accuracy scores). An accuracy score is the percentage of correct selections of a symbol in response to its spoken label and represents the symbol's guessability. The pre-test results from the experimental and control groups were statistically compared using the Mann-Whitney T-test (Steyn, Smith & du Toit, 1989). The results showed no difference between the two groups' pre-test results. The p-value, means and standard deviations are presented in Table 4.3.

TABLE 4.3 P-value, means and standard deviations of the experimental and control groups' pre-test data

	Experimental group		Control group		P-value
	Mean	Standard deviation	Mean	Standard deviation	
Pre-test	5.9583	2.4223	6.3182	2.2336	0.5413

* $p < 0.05$

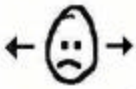
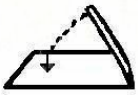
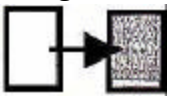
The experimental and control groups' pre-test data will be discussed seperately.

4.3.1 Presentation of the experimental group's pre-test results

When defining iconicity, different researchers use different criteria. Doherty, Daniloff and Lloyd (1985) and Haupt and Alant (2002) used strict (iconicity value $\geq$ 75 %) and lenient (iconicity value $\geq$ 50 %) criteria to interpret the transparency of American-Indian gestures and the iconicity of PCS symbols respectively. Iconicity values can be defined as the number of participants who responded correctly to each item and represent each symbol's guessability. In the current study it was decided to use the lenient criterion to interpret the data in terms of iconicity. The criterion thus being: accuracy score $\geq$ 50 %. An accuracy score can be defined as the percentage correct selections of a symbol in response to its spoken

label. Table 4.4 presents the experimental group's pre-test results. The symbols are presented from the symbol with the highest to the one with the lowest accuracy score.

TABLE 4.4 Ranking of symbols according to accuracy scores: experimental pre-test results

Areas	Symbol numbers, English phrases and Accuracy scores			
75% and over	6. Let's get the bed made.  (accuracy score = 92%)		9. Uh oh.  (accuracy score =83%)	
50% to 74%	16. Put it in the hamper.  (accuracy score = 67%)		10. Need to pull it.  (accuracy score = 63%)	
25% to 49%	12. What a mess!  (accuracy score = 43%)	13. Thank you.  (accuracy score = 42%)	5. No,  (accuracy score = 42%)	4. It's crooked.  (accuracy score = 29%)
	15. Have to fold it back.  (accuracy score = 26%)	8. Got to tuck it in.  (accuracy score = 25%)	3. Need to change them.  (accuracy score = 25%)	
13% to 24%	1. Let me.  (accuracy score = 21%)	11. They're dirty.  (accuracy score = 17%)	14. Help me please  (accuracy score = 13%)	
0% to 12%	2. Let's take this off.  (accuracy score = 8%)	7. Looks good.  (accuracy score = 4%)		

After reviewing the data as presented in Table 4.4 it is evident that two symbols (symbols 6 & 9) were correctly selected in response to their spoken label in the area ≥ 75 %. Two symbols (symbols 16 & 10) had an accuracy score in the area 50 % – 74 %. Most of the symbols (seven of the sixteen) had an accuracy score in the area 25 % – 49 % (symbols 12, 13, 5, 4, 15, 8, & 3). Three symbols (symbols 1, 11 & 14) had an accuracy score in the area 13 % –24 %, while two symbols (symbols 2 & 7) had an accuracy score of ≤ 12 %.

When interpreting the data according to the criterion set earlier, symbols 6 ('Let's get the bed made.'), 9 ('Uh oh',) 16 ('Put it in the hamper.') and 10 ('Need to pull it.') can be classified as iconic. Twenty-five percent of the symbols can thus be described as iconic for the participants in the experimental group in the current study.

4.3.2 Presentation of the control group's pre-test results

The ranking of the control group's pre-test results is presented in Table 4.5.

TABLE 4.5 Ranking of symbols according to accuracy scores: control pre-test results.

Intervals	Symbol numbers , English phrases and Accuracy scores			
75% and over	6 Let's get the bed made. (accuracy score = 82%)		16 Put it in the hamper. (accuracy score = 77%)	
50% to 74%	9 Uh oh. (accuracy score =73%)	10 Need to pull it. (accuracy score = 64%)	1 Let me. (accuracy score = 59%)	
25% to 49%	5 No, (accuracy score = 45%)	12 What a mess! (accuracy score = 40%)	11 They're dirty. (accuracy score = 36%)	4 It's crooked. (accuracy score = 36%)
	13 Thank you. (accuracy score = 29%)	14 Help me please. (accuracy score = 27%)		
13% to 24%	15 Have to fold it back. (accuracy score = 23%)	2 Let's take this off. (accuracy score = 18%)	8 Got to tuck it in. (accuracy score = 14%)	
0% to 12%	3 Need to change them. (accuracy score = 9%)		7 Looks good. (accuracy score = 0%)	

From Table 4.5 it is evident that two symbols (symbols 6 and 16) had an accuracy score of ≥ 75 %. Three symbols (symbols 9, 10 & 1) were selected correctly in response to their spoken labels in the area 50 % – 74 %. Most of the symbols (symbols 5, 12, 11, 4, 13 & 14) had an accuracy score in the area between 25 % and 49 %. A further three symbols (symbols 15, 2, & 8) were selected correctly in the area 13 % – 24 %. The final two symbols (symbols 3 & 7) had an accuracy score of ≤ 12 %.

According to the criterion set earlier symbols 6 ('Let's get the bed made.'), 16 ('Put it in the hamper.'), 9 ('Uh oh'), 10 ('Need to pull it.') and 1 ('Let me.') can be classified as iconic. Thus 31.25 % (accuracy score $\geq$ 50 %) of the symbols can be described as iconic for the control group participants in the current study.

4.3.3 Comparison between the experimental and control groups' pre-test data

As previously mentioned, statistical comparison showed no significant differences between the pre-test results of the two groups. Figure 4.1 gives a visual representation of the two groups' pre-test results and Figure 4.2 presents the differences between the two groups for each symbols.

FIGURE 4.1 Presentation of experimental and contol groups' pre-test results

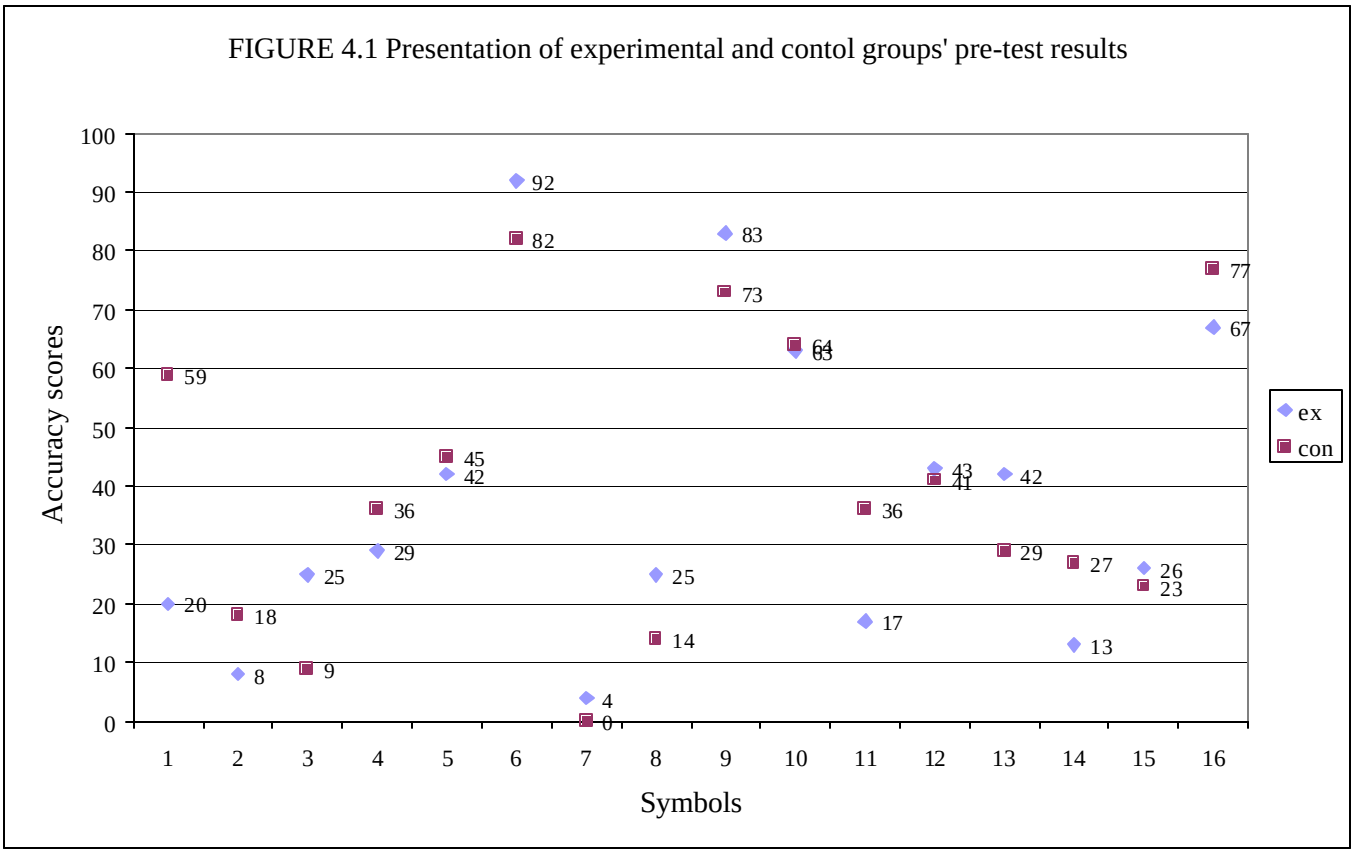


FIGURE 4.1 Representation of the experimental and control groups' pre-test results.

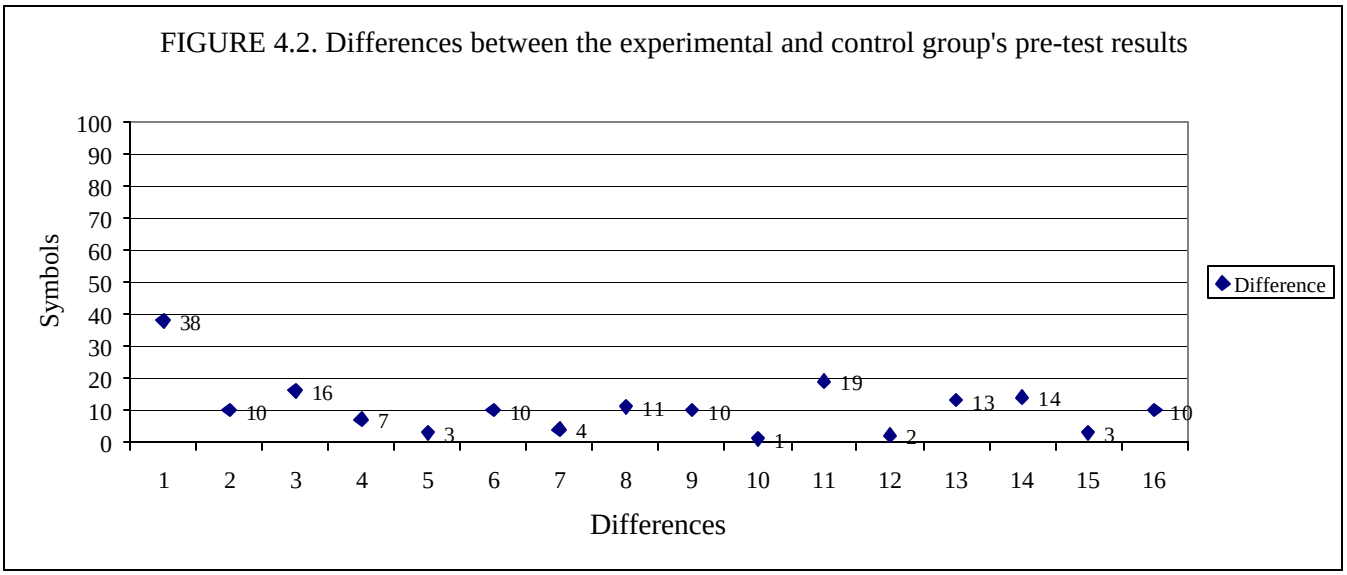


FIGURE 4.2 Differences between the pre-test results of the experimental and control groups

From inspecting Figures 4.1 and 4.2 it is evident that the symbol 1 presented with a 38 percentage point difference between the accuracy scores of the two groups. This was the greatest difference. Symbol 11 had the second greatest difference, namely 19 percentage points. The rest of the symbols showed a difference of less than 16 percentage point difference between the accuracy scores of the two groups.

Although there are differences between the two groups' results, symbols 6, 9, 10 and 16 all had accuracy scores of more than 50 % and symbol 7 accuracy scores of less than 12 % for both groups' of participants. Symbol 6 ('Let's get the bed made.') was the most iconic symbol for both groups. For the experimental group symbols 9 ('Uh oh'), 16 ('Put it in the hamper') and 10 ('Need to pull it.') had the second, third and fourth highest accuracy scores. For the control group, symbols 16 ('Put it in the hamper'), 9 ('Uh oh'), 10 ('Need to pull it.') and 1 ('Let me.'), had the second, third fourth and fifth highest accuracy scores. All the above-mentioned symbols were classified as iconic. For both the experimental and control groups, symbol 7 had the lowest accuracy score.

For the current study a difference of more than 30 percentage points was arbitrarily chosen as a great difference and a difference 10 percentage points and less as a small difference. From Figure 4.2 it is evident that the greatest difference per symbol was for symbol 1, with a percentage point difference of 38. Symbols 2, 4, 5, 6, 7, 9, 10, 12, 15 and 16 all showed a small difference of 10 percentage points or less, thus indicating a small difference. Symbols 3, 8, 11, 13 and 14 all had a medium difference. Why a great

difference exists between the pre-test scores of symbol 1 is unknown. As the groups were divided into different cohorts, it cannot be explained by different testing conditions.

4.4 Presentation of post-test results

4.4.1 Presentation of the results of the experimental group's post-test

The experimental group's post-test data is given in Table 4.6. The symbols are presented in order from highest to lowest accuracy score

TABLE 4.6 Ranking of symbols according to accuracy scores: experimental post-test results.

Intervals	Symbol numbers, English phrases and Accuracy scores		
75% and over	16 Put it in the hamper. (accuracy score = 100 %)	9 Uh oh. (accuracy score =100%)	6 Let's get the bed made. (accuracy score = 100%)
	10 Need to pull it. (accuracy score = 92%)	12 What a mess! (accuracy score = 91%)	14 Help me please. (accuracy score = 88%)
	4 It's crooked. (accuracy score = 75%)	5 No, (accuracy score = 75%)	1 Let me. (accuracy score = 75%)
50% to 74%	11 They're dirty. (accuracy score = 71%)	3 Need to change them. (accuracy score = 71%)	13 Thank you. (accuracy score = 67%)
	2 Let's take this off. (accuracy score = 63%)	8 Got to tuck it in. (accuracy score = 57%)	15 Have to fold it back. (accuracy score = 54%)
	7 Looks good. (accuracy score = 54%)		

When examining the experimental group's post-test data as presented in Table 4.6 it is evident that following the training session three symbols (symbols 6, 9, 16) obtained an accuracy score of 100%. Six other symbols (symbols 10, 12, 14, 4, 5 and 1) were correctly matched with their labels in the area $\geq$ 75 %. The other seven symbols (symbols 11, 3, 13, 2, 8, 15 and 7) all had an accuracy score of between 50 % and 74 %. When interpreting the post-test accuracy scores in accordance with the previously used criterion, all the symbols had an accuracy score of $\geq$ 50 %.

4.4.2 Presentation of control group's post-test results

The control group's post-test data is shown in Table 4.7. The symbols are presented in order from highest to lowest accuracy score.

TABLE 4.7 Ranking of symbols according to accuracy scores: control post-test results.

Intervals	Symbol numbers , English phrases and Accuracy scores		
75% and over	16 Put it in the hamper. (accuracy score = 95%)	9 Uh oh. (accuracy score = 91%)	6 Let's get the bed made. (accuracy score = 86%)
	10 Need to pull it. (accuracy score = 77%)		
50% to 74%	12 What a mess! (accuracy score = 73%)	1 Let me. (accuracy score = 57%)	5 No, (accuracy score = 55%)
25% to 49%	11 They're dirty. (accuracy score = 36%)	4 It's crooked. (accuracy score = 36%)	15 Have to fold it back. (accuracy score = 32%)
13% to 24%	13 Thank you. (accuracy score = 18%)	8 Got to tuck it in. (accuracy score = 18%)	3 Need to change them. (accuracy score 18%)
	14 Help me please. (accuracy score = 14%)		
0% to 12%	7 Looks good. (accuracy score = 9%)	2 Let's take this off. (accuracy score = 5 %)	

When viewing the control group's post-test accuracy scores as presented in Table 4.7 it is evident that four symbols were correctly selected in response to their spoken labels in the area $\geq$ 75 % (symbols 6, 9, 10 & 16). Three symbols had a post-test accuracy score of between 50 % and 74 % (symbols 1, 5 & 12). A further three symbols had a post-test accuracy score of between 25 % and 49 % (symbols 4, 11 and 15). Four symbols had an accuracy score of between 13 % and 24 % (symbols 3, 8, 13 & 10). In the area between 0 % and 12 % two symbols (symbols 2 & 7) were selected correctly in response to their spoken labels. When interpreting the post-test accuracy score in accordance with the criterion, seven symbols had an accuracy score of more than 50 %. Nine symbols had an accuracy score of less than 50 %. These nine symbols were distributed across the different intervals

4.5 Learnability

4.5.1 Experimental group: pre- vs. post-test results

The experimental group's pre- and post-test means were statistically compared, using the Wilcoxon T-test (Steyn, Smith & du Toit, 1989). The results showed a significant difference, indicating an improvement after the single training session. The results are summarized in Table 4.8. Figure 4.3 gives a graphical representation of the experimental group's pre- and post-test data.

TABLE 4.8 Results of the comparison between experimental group's pre- and post-test means

Mean	Standard deviation	P-value
6.217	2.5105	P< 0.0001

* p > 0.01

FIGURE 4.3. A graphical representation of the experimental group's pre- and post-test data.

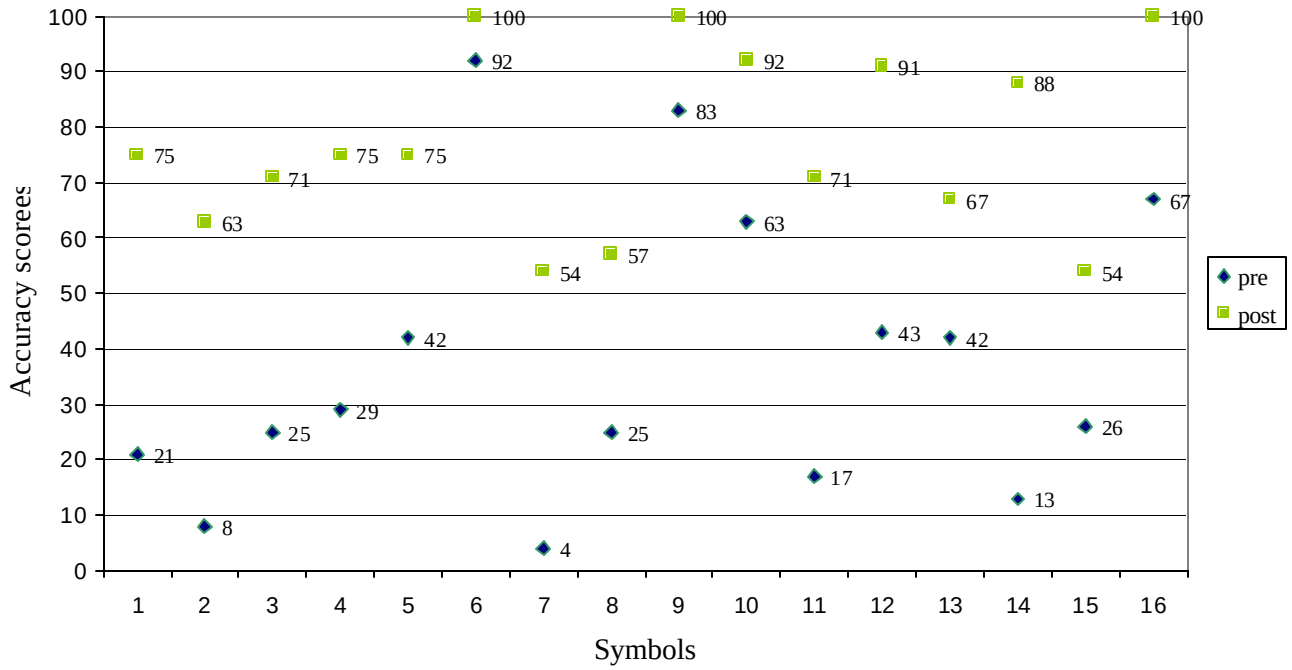


FIGURE 4.3 A graphical representation of the experimental group's pre- and post-test data.

As previously mentioned, all the symbols had a post-test accuracy score of more than 50 %. Three (symbols 6, 9, and 16) of the 4 previously classified iconic symbols had a post-test accuracy score of 100 % after the single training session. The fourth symbol (symbol 10) had a post-test accuracy score of 92 %. These results seem to support the iconicity theory (Fuller & Lloyd, 1979) with the four symbols with the

highest pre-test accuracy scores also having the highest post-test accuracy scores. Figure 4.4 shows the difference between the pre- and post-test results for each symbol in percentage points.

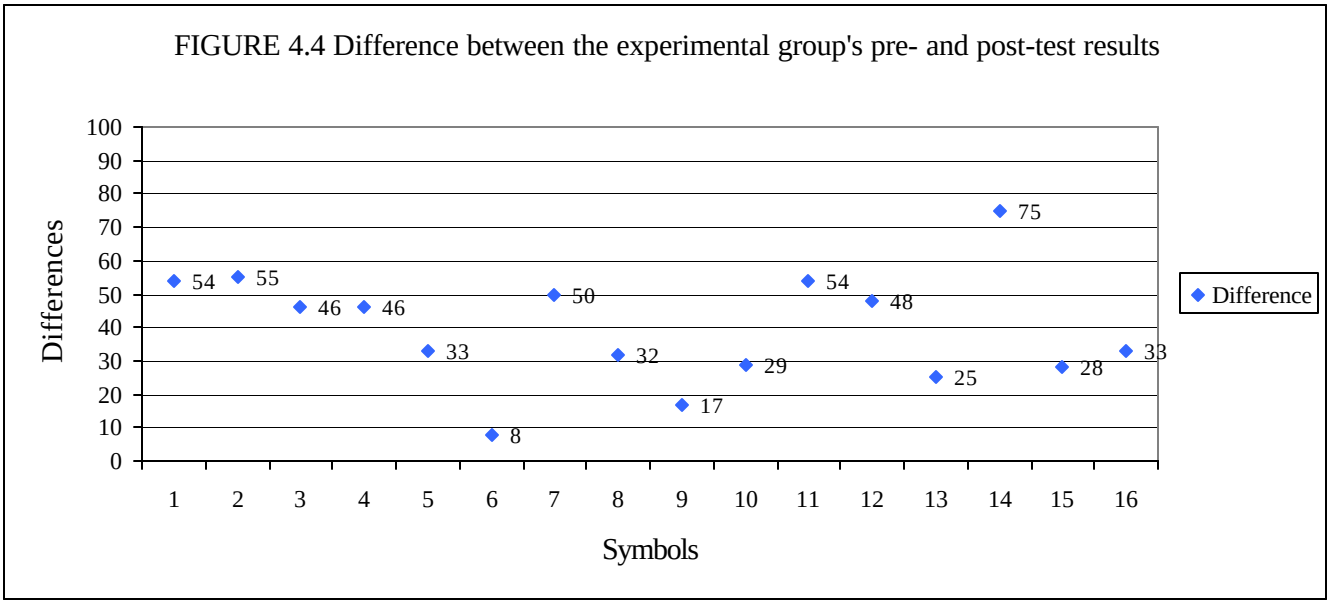


FIGURE 4.4 The difference between the experimental group's pre- and post-test results

From Figure 4.4 it is evident that 11 symbols (symbols 1, 2, 3, 4, 5, 7, 8, 11, 12, 14 &16) had a difference of more than 30 percentage points between their pre- and post-test accuracy scores. Only one symbol (symbol 6) showed a difference of less than 10 percentage points, while the other four symbols (9, 10, 13 & 15) had with a difference of between 10 and 30 percentage points.

The greatest improvement occurred for symbol 14 which had improved with 75 percentage points between the pre- and post-test accuracy scores. Apart from symbols 6 and 9, with a percentage point improvement of 8 and 17 percentage points respectively, symbol 13, 'thank you", showed the least improvement, namely 25 percentage points. Symbol 15 with a percentage point improvement of 28 shared the lowest post-test accuracy score of 54 % with symbol 7.

Haupt and Alant (2002) mentioned that a factor that could have contributed to the low iconicity of the population used in Haupt's (2001) study was the presence of arrows in many of the symbols. They warned that clinicians should be aware that special training in the use of arrows might be needed.

The current study had similar results (See 4.6) with all the symbols making use of arrows, having an experimental and a control accuracy score of less than 50 %. During the training process participants' attention were drawn to the arrows. Participants were led to use the arrows as part of their strategy to link the symbol and its meaning.

Of the seven symbols with arrows, three symbols had a post-test accuracy score of more than 70 %, two a post-test accuracy score of more than 60 % and the remaining two a post-test accuracy score of more than 50 %. The results seem to support Haupt and Alant's (2002) conclusion that training is needed in the use of arrows.

4.5.2 Control group: pre- vs. post-test results

The control group's pre-and post-test means were also statistically compared with the Wilcoxon T-test (Steyn, Smith & du Toit, 1989). Although the participants had not received any training, a significant difference was found. It was a slight improvement, which could mean that exposure through the pre-test had led to the recognition of more symbols during the post-test. The results are summarized in Table 4.9. Figure 4.5 gives a graphical representation of the experimental group's pre- and post-test data.

TABLE 4.9 Results of the comparison between control group's pre- and post-test means

Mean	Standard deviation	P-value
0.8636	1.9590	P= 0.0446

* $p > 0.01$

From Figure 4.5 it is evident that ten symbols (3, 5, 6, 7, 8, 9, 10, 12, 15 & 16) had increased in their accuracy scores. Two symbols (4 and 11) post-tests accuracy scores were equal to their pre-test accuracy scores, while the final four symbols (1, 2, 13 and 14) showed a decrease in their accuracy scores.

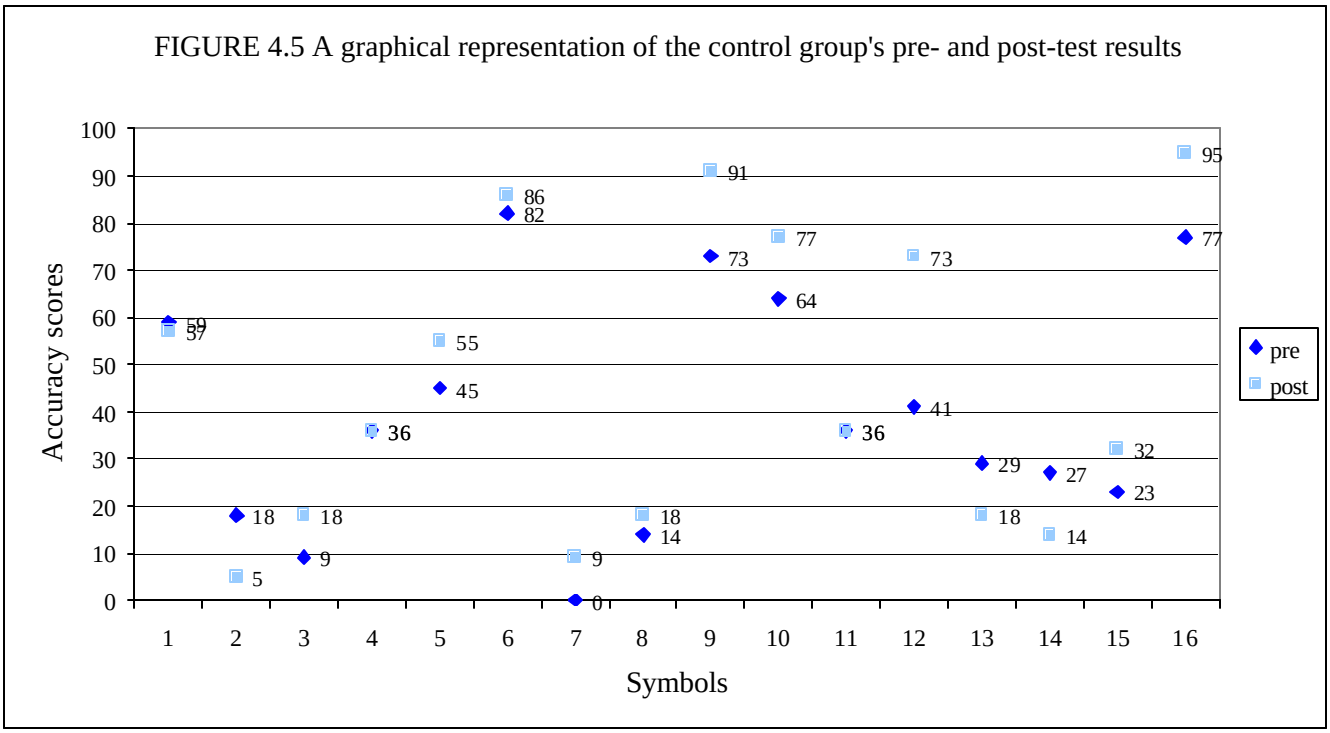


FIGURE 4.5 A graphical representation of the control group's pre-and post-test results

The five previously identified iconic symbols all had a post-test accuracy score of more than 50 %, although symbol 1 showed a decrease of 2 percentage points. Symbols 10, 6, 9 and 16 all had post-test accuracy scores of more than 75 %. A further two symbols (symbols 5 and 12) had a post-test accuracy score of between 50 % and 74 %. For the control group seven symbols had a post-test score of more than 50 %, two more than the five symbols with a pre-test accuracy score > 50 %. Figure 4.6 showed the difference between the pre- and post-test results for each symbol.

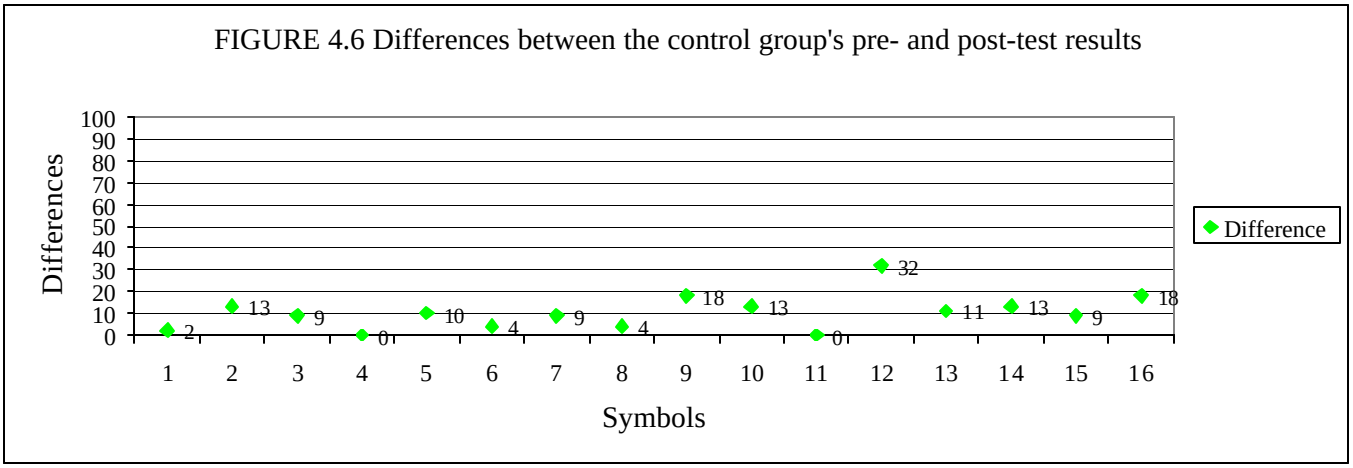


FIGURE 4.6 The differences between the control group's pre- and post-test results.

When viewing Figure 4.6, only symbol 12 had a difference of more than 30 percentage points between its pre- and post-test results. Six symbols (2, 9, 10, 13, 14 &16) had a difference of between 10 and 30 percentage points and 9 symbols (1, 3, 4, 5, 6, 7, 8, 11, &15) had a difference of less than 10 percentage points.

Only one (symbol 5) of the seven symbols with arrows had a post-test accuracy score of more than 50 %. Symbol 4's accuracy score stayed the same; while symbols' 2 and 13's post-test accuracy scores were less than their pre-test accuracy scores. It seems that the previous exposure through the pre-test procedure did not give the participants enough information to help them make better use of the cues afforded by the arrows.

4.5.3 Post-test differences between groups

In previous sections significant differences were indicated between the pre- and post-test accuracy scores for both groups. As indicated earlier, no significant differences existed between the two groups' pre-test results.

The differences between the post- and pre-test result of the two groups were compared using the Mann-Whitney T-test (Steyn, Smith & du Toit, 1989). The results are presented in Table 4.10. Figure 4.7 gives a graphical presentation of the differences between the post-test results of the experimental and control groups.

Table 4.10 Results of the comparison between difference of the experimental group's post- and pre-test results and the difference between the control group's post- and pre-test results.

	Experimental group		Control group		P-value
	Mean	Standard dev.	Mean	Standard dev.	
Difference	6.217	2.5105	0.8636	1.9590	P< 0.0001

* p< 0.05

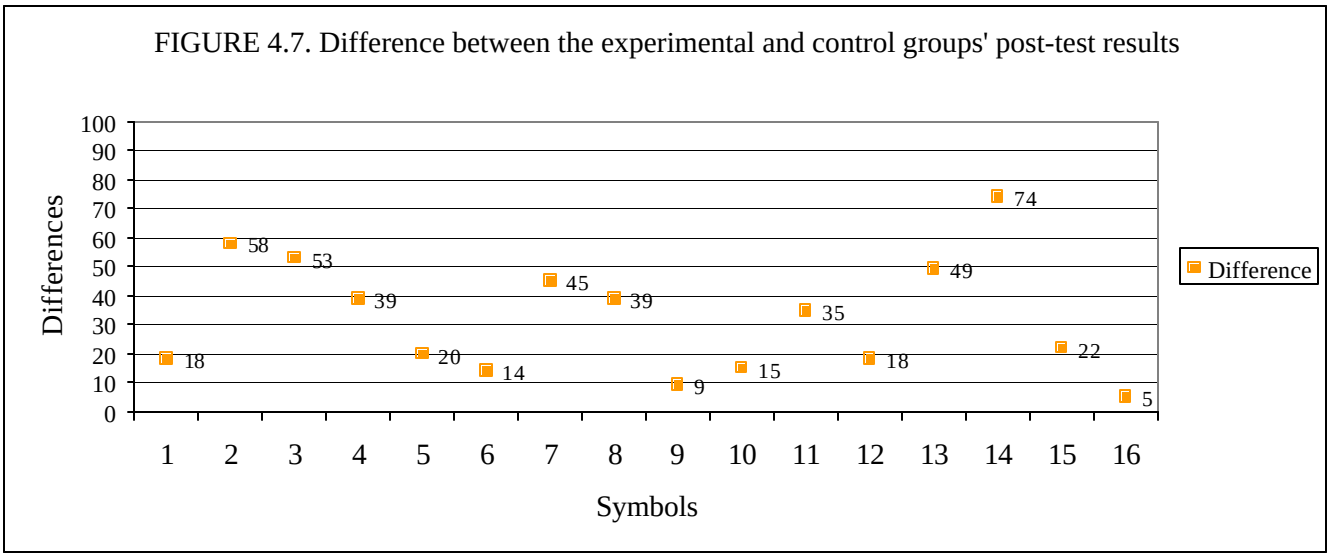


FIGURE 4.7 Difference between the pre- and post-test results of the experimental and control groups

When interpreting the data in Figure 4.7 it is evident that eight symbols (2, 3, 4, 7, 8, 11, 13 & 14) showed a great difference between the post-test data of the experimental and control groups data in contrast to the one symbol with a big difference when the pre-test results differences were discussed (See 4.3.3). Six symbols (1, 5, 6, 10, 12 & 15) showed a medium difference and only two symbols (9 & 16) had a small difference in contrast to the nine symbols with a small difference during the pre-test comparison.

These results confirm the fact that the experimental group benefited from the single training session and was able to remember the symbols easily. The increase between the pre- and post-test results from the experimental group was expected and can be attributed to the single training session the participants of this group received. The increase between the pre- and post -test results from the control group was not anticipated, but its occurrence can be explained by the single exposure the participants had during the pre-test procedure.

4.6 Comparison with a similar study

The iconicity part of the study is similar to a study by Haupt (2001) and Haupt and Alant (2002). In that study they investigated the iconicity of 39 PCS presented on a commercially available communication overlay. The participants in their study were 10-year-old Zulu-speaking children living in the rural areas of Kwazulu Natal.

Care must be taken when comparing the results of the current study with the results obtained by Haupt (2001). The number of variables that differ between the two studies makes it almost impossible to compare these studies. Table 4.11 presents the known variable differences. Other variables such as exposure to books and pictures, and parental education level could also be important. Haupt's (2001) results showed either 2.8 or 11.1% of the symbols in her study as iconic.

TABLE 4.11 Variable differences between the current study and Haupt's (2001) study

Variable	Current study	Haupt (2001)
Number of participants	49	94
Number of symbols	16	36
Age of participants	6 yrs	10 yrs
Language of participants	Afrikaans	isiZulu
Location of participants	Urban	Rural to Deep Rural

It is, however, possible to examine the data from both studies and discuss differences and similarities. The sixteen symbols used in the current study were chosen from the 36 symbols in Haupt and Alant's (2002) study. To prevent confusion, the symbol numbers used are those used in the current study. Figure 4.5 compares the data of the two studies.

FIGURE 4.8 A comparison between the combined pre-test results from the current study and results from the study by Haupt & Alant (2002)

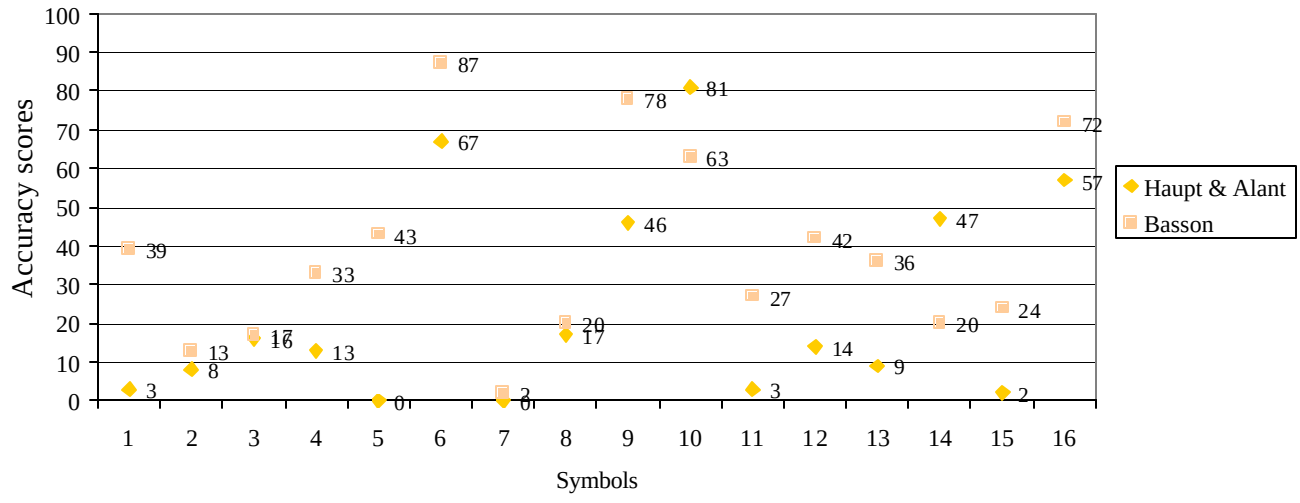


FIGURE 4.8 A comparison between the results from the current study and results from a study by Haupt and Alant (2002).

From inspecting Figure 4.8 it is evident that for the current study 4 symbols (6, 9, 16 and 10) can be classified as iconic. Three of the symbols (10, 6 and 16) used in the Haupt and Alant (2002) study can be classified as iconic, when using the same criterion (accuracy score $\geq$ 50 %). For both studies symbol 7 had the lowest accuracy score. With the exception of symbols 10 and 14, the individual symbols in the current study had higher accuracy scores than the same individual symbols in the Haupt and Alant (2002) study. Figure 4.9 gives a visual representation of the differences between the two studies' results for each symbol.

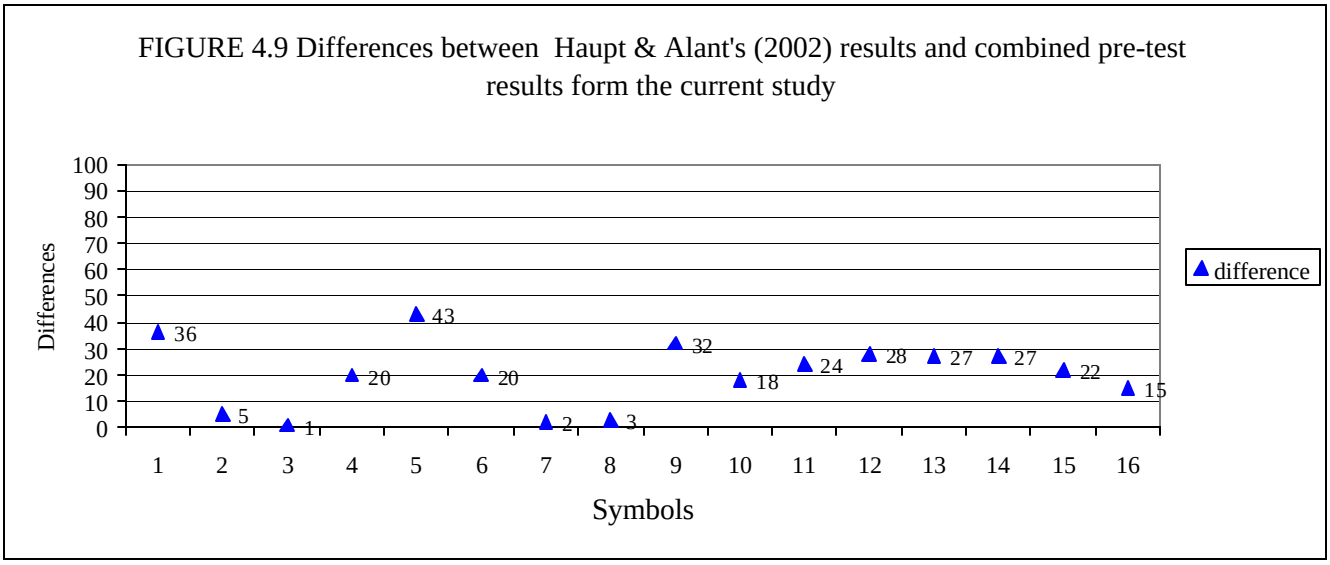


FIGURE 4.9 Differences between Haupt & Alant's (2002) results and the combined pre-test results from the current study

Three symbols (symbols 1, 5 & 9) had a difference of more than 30 percentage points, a further four symbols (Symbols 2, 3, 7, & 8) had smaller a difference than 10 percentage points.

Symbol 1 showed a percentage point difference of 36 percentage points. Although the combined pre-test results from the current study indicate that the participants did not find this symbol iconic they might have seen it as more iconic than the participants of Haupt' s (2001) study did. It should be remembered that this symbol was the one symbol in the current study where a great difference was present between the pre-test results of the experimental and control groups and that no specific reason could be given for this.

Symbol 5 showed the greatest difference (a difference of 43 percentage points) between the data of the two studies. Although once again the participants of the current study did not find the symbol 'no' iconic,

they did find it more iconic than the participants in Haupt's study did. It could be that the participants in the current study were able to use the cue given by the arrows better than the participants of the Haupt's study. The participants in the current study had had more experiences with books, computers and television, which might have led to them understanding this symbol better, although they were younger than the participants in Haupt's study.

Symbol 9 had a 32 percentage point difference. The participants in the current study indicated this symbol as iconic (accuracy score = 78%), while the participants of Haupt's study did not. The reason for this can be that in pronouncing the Afrikaans uh-uh the speaker's mouth looks like the mouth of the figure in the symbol, making it rather iconic.

For participants in both studies symbol 2 ('let us take it off'') was not iconic. Neither of the two studies' participants was able to use the cue given by the arrow as taking something off. It could also be that the participants saw this as meaning 'thank you', as it is an everyday use to take off one's hat in respect when thanking someone. With symbol 3 ('you need to change them') and 8 ('tuck it in') the participants in both studies once again did not use the cues provided by the arrows, confirming Haupt and Alant's (2002) statement that the use of arrows should be taught individually.

For both studies symbol 7 ('it looks good') was the least iconic one. This could be due to the fact that the sign from which this symbol is derived is unknown in the South African context, a thumbs up sign would probably have been a better choice to indicate 'It looks good'.

4.7 Summary

In this chapter the findings of the study were presented and discussed. Combined pre-test results revealed that the 16 PCS symbols used in the current study were between 12.5 % and 25 % iconic for the participants involved. Comparison between the pre-test results of the experimental and control groups showed no significant difference between the two samples.

Comparison between both groups' pre-and post-test results indicated a significant difference ($p < 0.05$) The difference between the two samples' post-test results were also significant ($p > 0.01$).

Although the results of the current study could not be statistically compared, differences were observed and discussed. These differences could be a reflection of the different cultural experiences of the participants in the two studies. Similarities in mistakes made by the two groups were observed.

CHAPTER 5
SUMMARY AND CONCLUSION

5.1 Introduction

In this chapter the results of the study are summarized and conclusions made. The study's strengths and limitations are noted and discussed. Finally recommendations for further research are made.

5.2 Summary and conclusion

The purpose of this study was to determine how accurately typically developing, urban, six-year-old, Afrikaans-speaking children could firstly, identify 16 PCS symbols, presented on a communication overlay, and secondly, recognize the symbols following exposure to a learning experience.

A quasi-experimental group design was used. Participants were pre-tested and divided into an experimental and a control group. The experimental group received training on the second day. All the participants were post-tested on the third day. The results indicated that the 16 PCS symbols had an iconicity of between 12.5 and 25 % for the combined group. The current study made use of criteria suggested by Doherty et al. (1985).

Results further showed an improvement in the post-test results of both experimental and control groups. The significant difference between the post-test results of both groups does, however, indicate that the experimental group recognized more symbols during the post-test than the control group.

The fact that the experimental group recognized more symbols showed that the experimental group's participants benefited from the single training session and were able to use the explanations to help them remember the symbols' meanings. The control group did not receive training, but a significant difference was found between pre- and post-results. This finding can be attributed to the single exposure the participants had to the symbols and labels during the pre-test procedure.

Although the results of the current study could not be statistically compared with a similar study (Haupt, 2001), as too many variables differed (age and culture of the participants as well as overlay size), descriptive comparisons reveal the following: For the current study, the 16 PCS symbols had an iconicity

of between 12.5 and 25 %, compared to Haupt's (2001) study where the 36 PCS symbols had an iconicity of between 3 and 11 %. Differences between the two studies could be a reflection of the different cultural experiences of the two groups as well as exposure in relation to a literate environment.

It seems as if the participants made use of the information afforded them by the postural cues implying motion. They did not, however, make full use of the arrow cues or the direction of the arrows, which also implied motion. This correlates with observations from Haupt (2001), Haupt and Alant (2002) and Moolman and Alant (1997). Once the participants in the experimental group were made aware of the arrows, they seemed to use the information the arrows offered to help them remember the symbol meanings during the post-test procedure.

5.3 Evaluation of the study

The current study took a further step in obtaining culture-specific iconicity information in the South African context. The study also investigated the learnability of PCS symbols after a single training session.

One of the strengths of the study is the homogeneity of the participants. This homogeneity is mainly due to the strict selection of participants according to specific selection criteria and the use of typically developing children. Higginbotham (1995) mentioned that the use of typical communicators could benefit the researcher's understanding of the cognitive processes underlying the acquisition of symbol competencies.

The results of the current study support previous research on the rather low percentage of PCS symbols that can be correctly identified on first exposure. It also indicates differences between children from different cultural backgrounds and exposure (current study and the Haupt & Alant 2002 study). The relatively small participant sample (n = 46) as well as the small symbol sample (n = 16) can be seen as two limitations of the study. Similarly, the use of a communication board with a specific theme can limit the generalizability of the iconicity values to the same symbols in other contexts. As the participants were typically developing children, the application of this data to children with disabilities is limited. The study does, however, provide some important information on first exposure and learning of PCS symbols.

5.4 Recommendations for further research

Recommendations for further research:

1 The use of a communication board with a larger grid, and thus a bigger symbol sample, could offer valuable results in further studies. The inclusion of different age groups in this task could also offer valuable information on the way children of different ages cope with the task
2 Further studies could use symbols without organizing them thematically. Comparisons can thus be made between children's ability to recognize and retain graphic symbols with and without a thematic context.
3 The current study used typically developing children as participants. It is important to gain information on the way people with disabilities (typically users of AAC) perceive and learn PCS. As people with disabilities form a heterogenic group, studies would involve small participant samples, for example, multiple case studies.
4 There is a need for more culture-specific studies investigating the iconicity and/or learnability of PCS in other cultures than those of rural Zulu- and urban Afrikaans-speakers, e.g. urban Zulu- and rural Afrikaans-speakers and speakers of the other Southern African languages.
5 Cross-cultural studies are also needed in order to investigate the similarities and differences concerning the iconicity and/or learnability of PCS amongst the different cultural groups and in different countries.
6 Studies investigating the learnability of PCS; specifically investigating different teaching strategies (paired associate paradigm versus current strategy) and their influence on the speed and accuracy of learning.

5.5 Summary

This chapter gave an overview of the study. In brief, the purpose of the study was to investigate the iconicity and learnability of 16 PCS symbols. Results revealed an iconicity of between 12.5 and 25 %. Results further indicated a single training session to be enough to cause significant change between the pre- and post-test results and to indicate that learning took place. The single exposure through the pre-test procedure also led to a significant (though smaller) change between the control group's pre- and post-test results.

This study is the first step in investigating the learnability of PCS symbols in South Africa. More research is needed in this area using different PCS symbols, different age and culture groups, as well as typically developing as well as participants with disabilities.

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APPENDIX A

A COPY OF THE LETTER SENT TO THE FREE STATE DEPARTMENT OF EDUCATION TO OBTAIN PERMISSION TO CONDUCT THE STUDY IN THE LEJWELEPUTSWA-DISTRICT IN THE PROVINCE

1 Title(Mr, Ms, Dr, Prof) Ms

2 Initials and surname H.M. Basson

3 Telephone

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9459

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9460

6 Name of tertiary institution/research institute
University of Pretoria; Centre for Augmentative and Alternative Communication (CAAC).

7 Name of course
Masters in Augmentative and Alternative Communication. MA(AAC).

8 Name of supervisor/promoter
Professor E. Alant
Ms M. Mophosho

9 Title of research project
The Iconicity and Recognition of Selected Picture Communication Symbols for Afrikaans-speaking Children.

10 Explanation
The aim of the current study is to investigate the iconicity and recognition of selected Picture Communication Symbols (PCS) among 6-year old Afrikaans-speaking children. The participants will be divided into two as groups, as homogeneous possible. Both groups will be exposed to pre-test and post-test procedures. During the test procedures participants will be provided with an overlay containing 16 PCS on the bed-making theme. The researcher will call out the labels in a predetermined order. The participants must then match the called label to the symbol, which they think best represents this label. All symbols on the overlay will be labeled and the symbols will act as foils for one another. The experimental group will have an extra session during which they will be exposed to the same symbols in a learning situation. The researcher will label the symbols correctly and also explain them. The results

from the pre-tests will be used to calculate the iconicity of these thematically displayed symbols. The results from the post-tests will be used to see whether the experimental group was able to recognize more symbols than the control group. If the experimental group recognized significantly more symbols than the control group, it will show that the participants were able to remember PCS after just one learning exposure. The researcher hypothesizes that the experimental group will identify a greater percentage of symbols correctly during the post-test than the control group. This will be as result of the one learning exposure.

11 Application value that the research may have for the Free State Education Department

As Inclusion is implemented in schools, children with little or no functional speech (LNFS) will be included in mainstream and full service classes. These children will need a means of communication if they are to be successful in school. Communication boards are one way of giving these children a means of communication. To ensure proper implementation of this means, information is needed on the way children perceive and learn (recognize) the symbols(pictures) on these communication boards. With the information obtained through this study speech therapists in service of the Department of Education will have information which could help them in providing a service to learners with LNFS in the Free State Province.

12.1 The full particulars of the group with which the research is to be undertaken

Afrikaans-speaking 6-year-olds in grade R, living in Welkom/Riebeeckstad in the Lejweleputswa Education District, Free State.

12.2 List of schools/Directorates in the Department/Officials

• The list of schools with an Afrikaans grade R class was taken from a list provided by ms. H. de Bruyn (FES:ECD) in 2002.
• Between 2 – 5 schools will be randomly selected (ideally 2 schools for the main study and 1 school for the pilot study).

Koppie Alleen Pre-Primêre Skool (Riebeeckstad)
Riebeeckstad Pre-Primêre Skool (Riebeeckstad)
Dagbreek Pre-Primêre Skool (Welkom)
Doorn Pre-Primêre Skool (Welkom)
Naudeville Pre-Primêre Skool (Welkom)
St Helena Pre-Primêre Skool (Welkom)
Welkom Volkskool Pre-Primêre Skool (Welkom)

• Schools in Virginia might also be used in the pilot study.
Harmonie Pre-Primêre Skool (Virginia)
Merriespruit Pre-Primêre Skool (Virginia)
Virginia Pre-Primêre Skool (Virginia)

12.3 Grades

Grade R

12.4 Age and gender groups

Gender Both male and female.
Age Between 6 yrs and 6 yrs 11 months

12.5 Language groups

Afrikaans

12.6 Numbers to be involved in the research project

Sixteen participants in the pilot study and 60 participants in the main study.

13 Full particulars of how information will be obtained, e.g. questionnaires, standardized tests. Please include copies of questionnaires, questions that will be asked during interviews, tests that will be completed or any other relevant documents regarding the acquisition of information.

1 Questionnaires to parents
2 Test administered to learners (During the test procedures participants will be provided with an overlay containing 16 PCS on the bed-making theme. The researcher will call out the labels in a predetermined order. The participants must match the called label to the symbol they think best represents of this label. All symbols on the overlay will be labeled and the symbols will act as foils for one another.)
3 Learning material.

14. The starting and completion dates of the research project (Please bear in mind that research is usually not allowed to be conducted in the schools during fourth term.)

Starting date As soon as possible (pilot study in May 2003).
Date of completion Final dissertation to be given in on 31 October 2003
End of July 2003 Work in schools preferably finished.

15 Will the research be conducted during or after school hours?

During.
(Young children will be too tired later in the day. This could influence results.)

16 If necessary to use school hours for the research project, how much time will be needed?

At most an hour per group.

17 How much time will be spent on the research project by individual educators and/or learners?

Educators No more than two hours when helping researcher with selection of participants.
Learners Experimental group: 3 days @ an hour a day.
Control group: 2 days @ an hour a day.

18 Have you included

18.1 A letter from your supervisor confirming your registration for the course you are following? **YES**/NO

18.2 A draft of the letter that will be sent to the principals requesting permission to conduct research in their schools? **YES**/NO

18.3 A draft of the letter that will be sent to parents requesting permission for their children to participate in the research project (If applicable) **YES**/NO

18.4 Copies of questionnaires that you wish to distribute? **YES**/NO

18.5 A list of questions that will be asked during the interviews? **YES**/NO

I confirm that all the information given on this form is correct.

_____ _____

Signature Date

APPENDIX B

A LETTER FROM THE FREE STATE DEPARTMENT OF EDUCATION TO GIVE PERMISSION TO CONDUCT THE STUDY IN THE LEWELEPUTS A DISTIRCT

FREE STATE PROVINCE

Enquiries :Mrs M V Wessels/ Tel:(051} 404 8075
Reference no. :16/4/1/10-2003 Fax ;(051) 4048074
2003-04-09

Ms H M Basson
POBox 3373
WELKOM
9459

Dear Ms Basson

REGISTRATIONO F RESEARCH PROJECT

1.This letter is in reply to your application for the registration of your research project

2.Research topic: **THE ICONICITY AND RECOGNITION OF SELECTED PICTURE COMMUNICATION SYMBOLS FOR AFRIKAANS-SPEAKING CHILDREN**

3.Your research project has been registered and you may conduct research in the Free State Department of Education under the following conditions:

3.1 Learners and educators participate voluntarily in the project.
3.2 The names of the learners involved remain confidential.
3.3 This letter is shown to all participating persons.

4.You are requested to donate a report on this study to the Free State Department of Education. will be placed in the Education Library, Bloemfontein.

5.Once your project is complete, we should appreciate it if you would present your findings to the relevant persons in the FS Department of Education. This will increase the possibility of implementing your findings wherever possible.

Would you please write a letter accepting the above conditions? Address this letter to:

The Head: Education, for attention: CES: IRRISS Room 1213, C R Swart Building
Private Bag X20565, BLOEMFONTEIN, 9301

7.We wish you every success with your research.

Yours sincerely

Chief Director: Education Development
And Professional Services

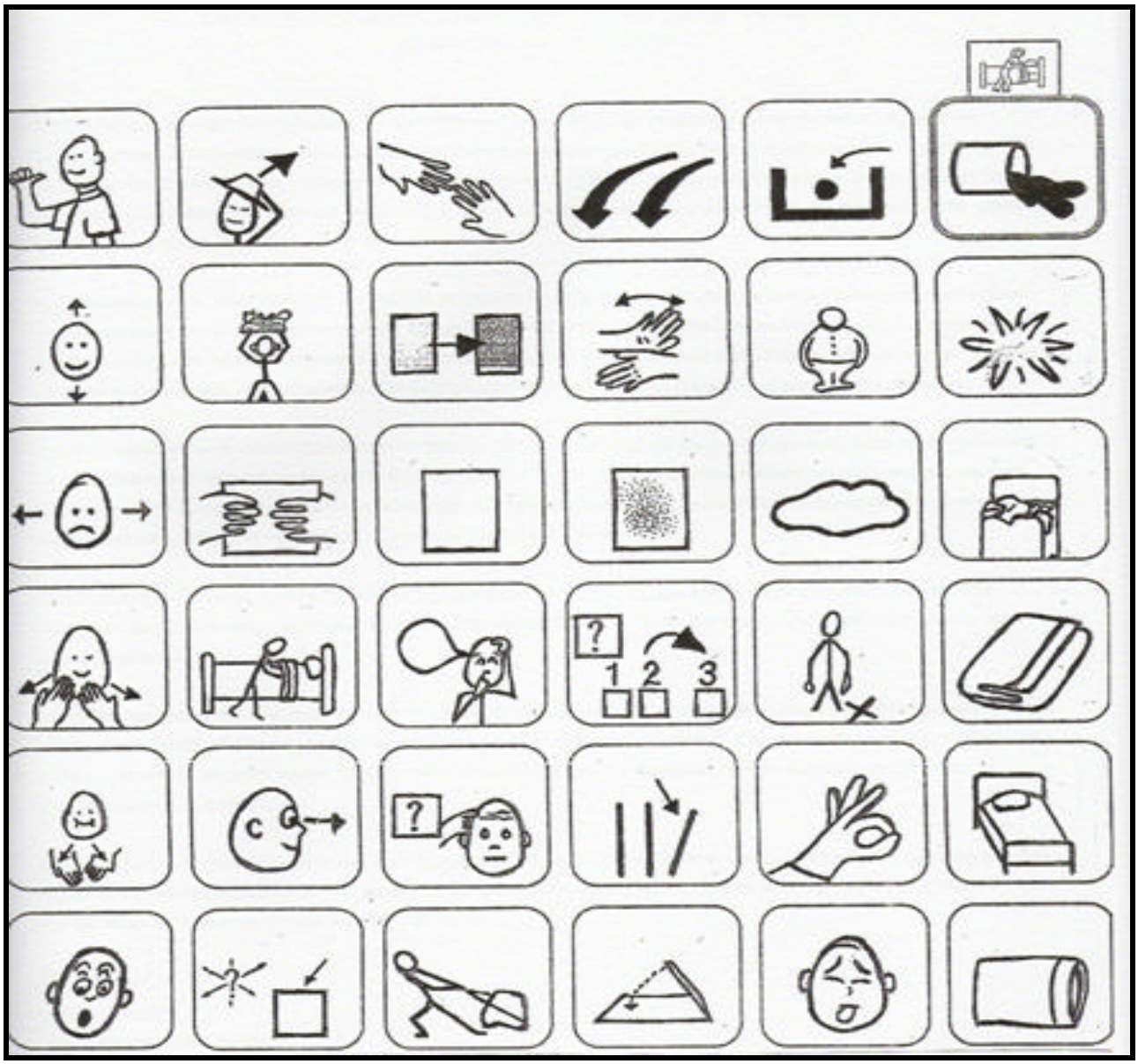
Department of Education V Departement van Onderwys V Lefapha la Thuto

APPENDIX C

PRE-TEST TRAINING-OVERLAY USED DURING PRE-PILOT

APPENDIX D

TEST-OVERLAY USED DURING PRE-PILOT



APPENDIX E

LETTER TO SCHOOLS TO INTRODUCE STUDY AND OBTAIN PERMISSION TO CONDUCT STUDY IN SCHOOLS

Beste……

Ek is 'n Spraakterapeut en Oudioloog by die Welkom Opvoedkundige Hulpsentrum en is tans besig met my magister graad in Aanvullende en Alternatiewe Kommunikasie onder Prof E Alant (Universiteit van Pretoria). Die Vrystaatse Departement van Onderwys het reeds toestemming tot die studie verleen, maar u het die reg om te besluit of u skool aan die studie sal deelneem al dan nie. Hiemee vra ek u toestemming dat leerders uit die graad R-klas by u skool aan my studie mag deelneem.

Nie alle kinders is in staat om deur middel van spraak te kommunikeer nie. Hierdie kinders moet van alternatiewe maniere gebruik maak om hulle behoeftes en gevoelens uit te druk. Aanvullende en Alternatiewe Kommunikasie (AAK) is 'n veld wat daarop toegespits is om hierdie kinders addisionele wyses van kommunikasie te gee. Van die metodes is die aanleer van gebaretaal, die gebruik van rekenaars en die gebruik van kommunikasieborde.

Kommunikasieborde is relatief goedkoop en behels dat prente of simbole op 'n bord geplaas word en die gebruiker na spesefieke simbole wys en so wys wat hy/sy wil hê. Daar is verskeie simboolstelsels en dis belangrik dat ons inligting insamel oor onder andere, die akkuraatheid waarmee kinders die betekenis van die simbole wat ons gebruik kan raai, sowel as hoe maklik hulle die simbole kan aanleer.

Daar bestaan feitlik geen navorsing hieroor in Suid-Afrika nie. Die huidige studie se doel is om te bepaal hoe akkuraat **6 jarige Afrikaanssprekende** kinders die betekenis van simbole kan raai en hoeveel hulle tydens een onderrig sessie kan leer.

Die studie sal vereis dat leerders wat aan die seleksie kriteria voldoen vir drie opeenvolgende dae in groepe van agt vir ongeveer 'n halfuur per groep met die navorser en haar assistent deurbring. Die navorser benodig 'n lokaal met tafels en stoele en versoek verder toestemming om afskrifte van die klaslyste met die leerders se name en geboortedatums te bekom.

Indien ek deel van die studie by u kan kom uitvoer, sal ek op 'n latere stadium u en/of die betrokke onderwyseresse kontak om finale reëlings te tref. Vul asseblief die onderstaande strokie in en faks aan my by 057 353 3669. Indien u enige vrae het kan u my kontak by 057 352 4659.

Baie dankie
Magdel Basson
Spraakterapeut en Oudioloog

Hiermee verleen ek _____, skoolhoof van

_____dat graad R leerders by my skool aan die

studie deelneem.

_____ _____

Geteken **Datum**

APPENDIX F

LETTER TO PARENTS TO INTRODUCE STUDY AND OBTAIN PERMISSION TO ALLOW CHILDREN TO PARTICIPATE IN THE STUDY

Beste ouer/voog,

Dankie dat u die tyd neem om die onderstaande inligting deur te lees en die aangehegte vraelys in te vul. Ek is tans besig met my magister graad in Aanvullende en Alternatiewe Kommunikasie by die Universiteit van Pretoria onder leiding van Prof E Alant en wil graag u toestemming vra dat u kind magelneem in my studie.

Nie alle kinders is in staat om deur middel van spraak te kommunikeer nie. Hierdie kinders moet van alternatiewe maniere gebruik maak om hulle behoeftes en gevoelens uit te druk. Aanvullende en Alternatiewe Kommunikasie (AAK) is 'n veld wat daarop toegespits om hierdie kinders addisionele wyses van kommunikasie te gee. Van die metodes is die aanleer van gebaretaal, die gebruik van rekenaars en die gebruik van kommunikasieborde.

Kommunikasieborde is relatief goedkoop en behels dat prente of simbole op 'n bord geplaas word en die gebruiker na spesifieke simbole wys en so wys wat hy/sy wil hê. Daar is verskeie simboolstelsels en dis belangrik dat ons inligting insamel oor onder andere, die akkuraatheid waarmee kinders die betekenis van die simbole wat ons gebruik kan raai, sowel as hoe maklik hulle die simbole kan aanleer.

Daar bestaan feitlik geen navorsing hieroor in Suid-Afrika nie. Die huidige studie se doel is om te bepaal hoe akkuraat **6 jarige Afrikaanssprekende** kinders die betekenis van simbole kan raai en hoeveel hulle tydens een onderrig s essie kan leer.

Die inligting wat verkry word uit die vraelys sal gebruik word om die populasie van die studie te beskryf. Die inligting op die vraelys sowel as die toets resultate sal **streng vertroulik** behandel word. Data kan egter moontlik gebruik word vir die opstel van wetenskaplike artikels, referate en aanvullende navorsing.

Voltooi asseblief die aangehegte vraelys en stuur asseblief voor of op _____ terug aan u kind se onderwyseres. *Indien ons nie die afskeurstrokie terug ontvang nie, sal ons aanneem dat u goedkeuring verleen dat u kind in hierdie studie mag deelneem.*

Soos met die skoolhoof gereël sal ek die skool op _____ besoek om die data in te samel. Indien u enige vrae het kan u my kontak by 057 352 4659. As u te eniger tyd u kind aan die studie wil onttrek is u welkom. Laat weet asseblief u kind se onderwyseres of skakel my by die bovermelde nommer.

Baie dankie
Magdel Basson
Spraakterapeut en Oudioloog

Vul asseblief relevante gedeelte in. Indien u wel toestemming gee, vul asseblief die res van die vraelys in.

- Hiermee gee ek _____ ouer /voog van

_____(geboortedatum: ___/___/_____) **toestemming**

dat my kind aan die studie deelneem.

- Hiermee gee ek _____ ouer /voog van

_____ **nie toestemming** dat my kind aan die studie

deelneem **nie**.

Geteken

_____
Ouer/voog

Antwoord asseblief die volgende vrae

1.1 Het u kind enige gehoorprobleme waarvan u bewus is? JA__ / NEE__

Indien u antwoord JA was by vraag 1.1 beantwoord asseblief vraag 1.2

1.2 Is daar enigiets aan gedoen? JA__/ NEE__

Indien u antwoord JA was by vraag 1.2 beantwoord asseblief vraag 1.3

1.3 Wat is gedoen?

Gehoorapparaat ___
Kogleêre implanting ___
Operasie ___
Niks ___
Iets anders ___

Indien iets anders gedoen is, beskryf kortliks wat: _____
_____
_____

2.1 Het u kind enige probleme met visie waarvan u bewus is? JA__ / NEE__

Indien u antwoord JA was by vraag 2.1 beantwoord asseblief vraag 2.2

2.2 Is daar enigiets aan gedoen? JA__/ NEE__

Indien u antwoord JA was by vraag 2.2 beantwoord asseblief vraag 2.3

2.3 Wat is gedoen?

Bril ___
Kontaklense ___
Operasie ___
Niks ___
Iets anders ___

Indien iets anders gedoen is, beskryf kortliks wat: _____
_____
_____

3.1 Praat u SLEGS Afrikaans by die huis? JA__ / NEE__

Indien u antwoord NEE was by vraag 3.1 beantwoord asseblief vraag 3.2

3.2 Watter ander tale word tuis gepraat?_____
_____

3.3 Wat is die vader se moedertaal? _____

3.4. Wat is die moeder se moedertaal? _____

4.1 Ontvang u kind enige terapie? JA__ / NEE__
Indien u antwoord JA was by vraag 4.1 beantwoord asseblief vraag 4.2

4.2 Watter terapie ontvang u kind?

Spraakterapie __
Arbeidsterapie __
Fisioterapie __
Taalterapie __
Ouditiewe perseptuele terapie __
Ander _____
_____
_____

5 Wat is u beroep?

5.1 Vader _____

5.2 Moeder _____

6 Wat is die hoogste vlak van opleiding (dui aan)?

6.1 Vader Primêre opleiding _____

Sekondêre opleiding _____

Tersiêre opleiding _____

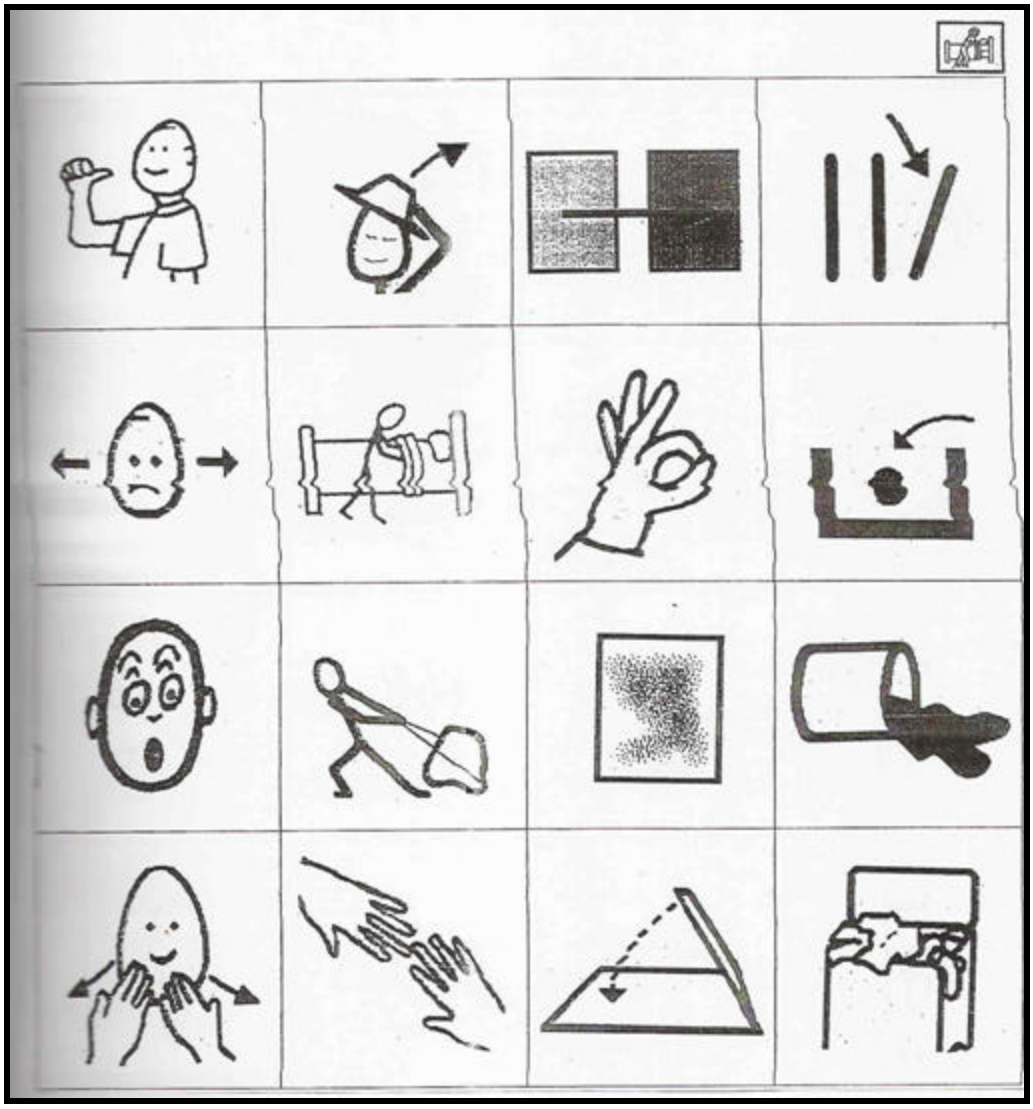
6.2 Moeder Primêre opleiding _____

Sekondêre opleiding _____

Tersiêre opleiding _____

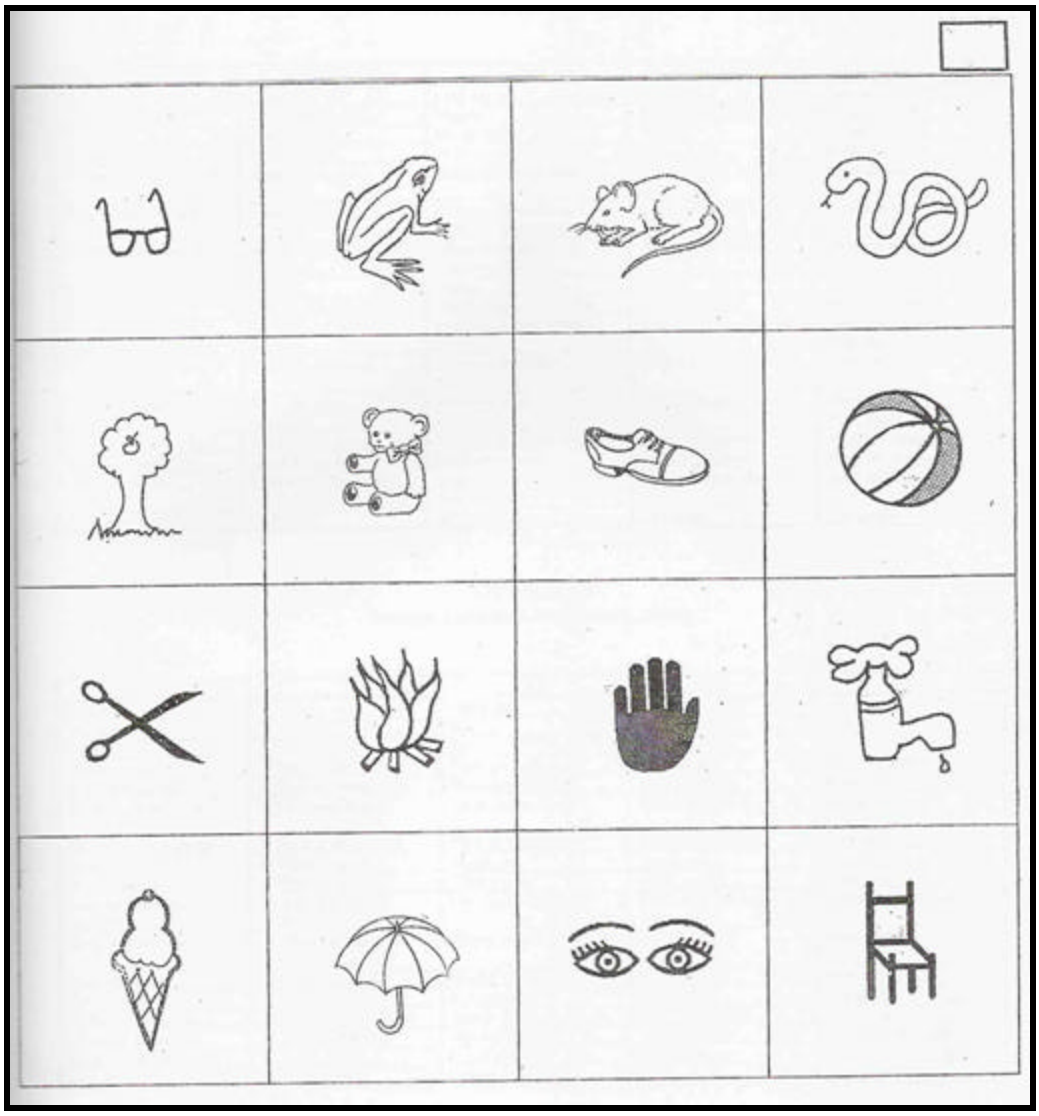
APPENDIX G

TEST-OVERLAY USED DURING STUDY



APPENDIX H

PRE-TEST-TRAINING OVERLAY USED DURING STUDY



APPENDIX I

FIRST CONSENSUS IN TRANSLATION

Original English text	Translator A1	Translator A2	Translator A3	Consensus
1. Let me	**Laat ek**	**Laat my toe**	**laat ek**	**Laat ek**
2. No; don't; not	Nee; moenie; nie	Moenie	Nee; moenie; nie	**Moenie.**
3. Uh oh	**H'n – 'n!**	**Uh oh / oeps**	**Uh oh**	**Uh oh**
4. They're dirty.	Hulle is vuil.	Hulle is vuil.	Hulle's vuil.	**Hulle is vuil.**
5. Need to change them.	**Moet dit omruil.**	**Nodig om dit te ruil.**	**Dis nodig om hul om te ruil.**	**Moet dit omruil.**
6. Let's take this off.	**Laat ons dit afhaal.**	**Kom ons haal dit af. / Kom ons trek dit uit.**	**Laat ons dit uit trek.**	**Kom ons haal dit af.**
7. Put it in the hamper.	**Sit dit in die mandjie.**	**Plaas dit in die wasgoedmandjie**	**Sit dit in die mandjie**	**Sit dit in die mandjie.**
8. Thank you.	Dankie.	Dankie	Dankie	**Dankie**
9. What a mess!	Wat 'n gemors!	Wat 'n gemors!	Wat 'n gemors!	**Wat 'n gemors!**
10. Let's get the bed made.	Laat ons die bed opmaak.	Laat ons die bed opmaak.	Laat ons die bed gemaak kry.	**Laat ons die bed opmaak.**
11. Help me, please.	Help my, asseblief.	Help my, asseblief.	Help my, asseblief.	**Help my, asseblief.**
12. Need to pull it.	**Moet dit trek.**	**Moet dit trek.**	**Dis nodig om te trek.**	**Moet dit trek.**
13. It's crooked.	Dis skeef.	Dis skeef.	Dis krom.	**Dit is skeef.**
14. Have to fold it back.	Moet dit terugvou.	Moet dit terugvou / omvou.	Moet dit terugvou.	**Moet dit terugvou**
15. Got to tuck it in.	**Moet dit invou.**	**Moet dit insteek.**	**Moet dit insteek.**	**Moet dit invou.**
16. Let's put on …	**Laat ons … oorgooi**	**Kom ons trek aan / Kom ons sit dit op**	**Kom ons trek aan.**	**Kom ons sit dit op.**
17. Looks good.	**Lyk goed.**	**Dit lyk goed.**	**Lyk goed**	**Lyk goed.**

APPENDIX J

SECOND CONSENSUS IN TRANSLATION

		E1	E2	E3
LAAT EK.	1. Let me	Allow me	Let me	Let me
Moenie.	2. No; don't; not	Don't	Don't	Don't
Uh oh	3. Uh oh	No	Oh oh	Uh oh
Hulle is vuil.	4. They're dirty.	They are dirty	They're dirty	They are dirty
Moet dit omruil.	5. Need to change them.	Should exchange it	Must change it	Must exchange it
Kom ons haal dit af.	6. Let's take this off.	Let us take it down	Come, we take it off	Let us take it down
Sit dit in die mandjie.	7. Put it in the hamper.	Put it in the basket	Put it in the basket	Put it in the basket
Dankie	8. Thank you.	Thank you	Thank you	Thank you
Wat 'n gemors!	9. What a mess!	What a mess	What a mess	What a mess
Laat ons die bed opmaak.	10. Let's get the bed made.	Let's make the bed	Let's make the bed	Let us make the bed
Help my, asseblief.	11. Help me, please.	Please, help me	Please help me	Please help me
Moet dit trek.	12. Need to pull it.	Should pull it	Must pull it	Must pull it
Dit is skeef.	13. It's crooked.	It is crooked	That's skew	It is skew
Moet dit terugvou	14. Have to fold it back.	Should fold it back	Must turn it back	Fold it back
Moet dit invou.	15. Got to tuck it in.	Should fold it in	Must fold it in	Fold it to the inside
Kom ons sit dit op.	16. Let's put on …	Let us put it up	Let's put it on	Let us it
Lyk goed.	17. Looks good.	Look's good	Looks good	Looks good

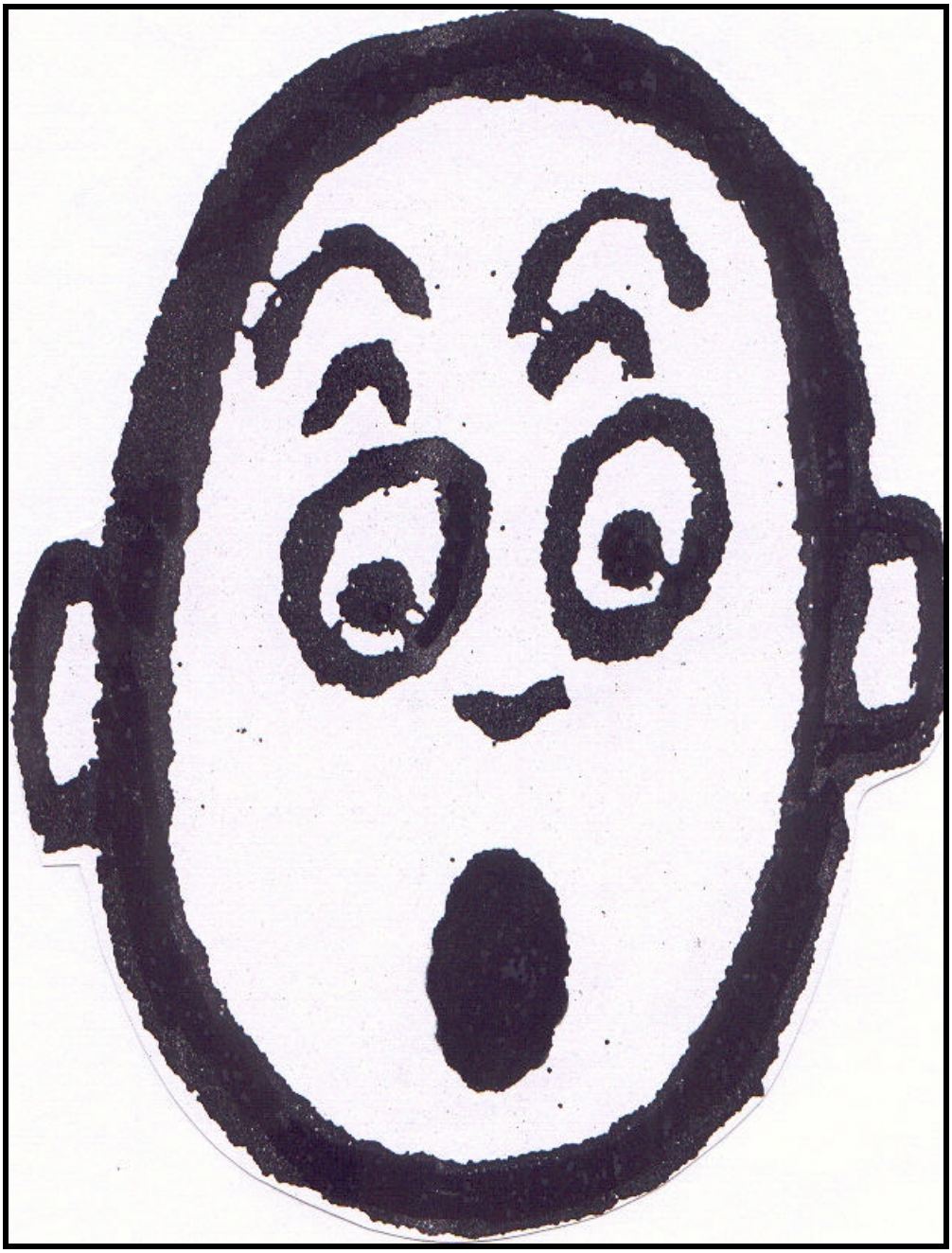
APPENDIX K

FINAL CONSENSUS IN TRANSLATION

Original English	Afrikaans consensus (First translators A1 & A2)	Afrikaans consensus (Second translators E2 & E3)
1. Let me	Laat ek.	Laat ek
2. No; don't; not	Moenie.	Moenie
3. Uh oh	Uh oh	Uh oh
4. They're dirty.	**Hulle is vuil.**	**Dit is vuil.**
5. Need to change them.	Moet dit omruil.	Moet dit omruil.
6. Let's take this off.	Kom ons haal dit af.	Kom ons haal dit af.
7. Put it in the hamper.	**Sit dit in die mandjie.**	**Sit dit in die wasgoedmandjie**
8. Thank you.	Dankie	Dankie
9. What a mess!	Wat 'n gemors!	Wat 'n gemors.
10. Let's get the bed made.	Laat ons die bed opmaak.	Laat ons die bed opmaak.
11. Help me, please.	Help my, asseblief.	Help my, asseblief.
12. Need to pull it.	Moet dit trek.	Moet dit trek.
13. It's crooked.	Dit is skeef.	Dit is skeef.
14. Have to fold it back.	Moet dit terugvou	Moet dit terugvou.
15. Got to tuck it in.	Moet dit invou.	Moet dit invou.
16. Let's put on …	Kom ons sit dit op.	Kom ons sit dit op.
17. Looks good.	Lyk goed.	Lyk goed.

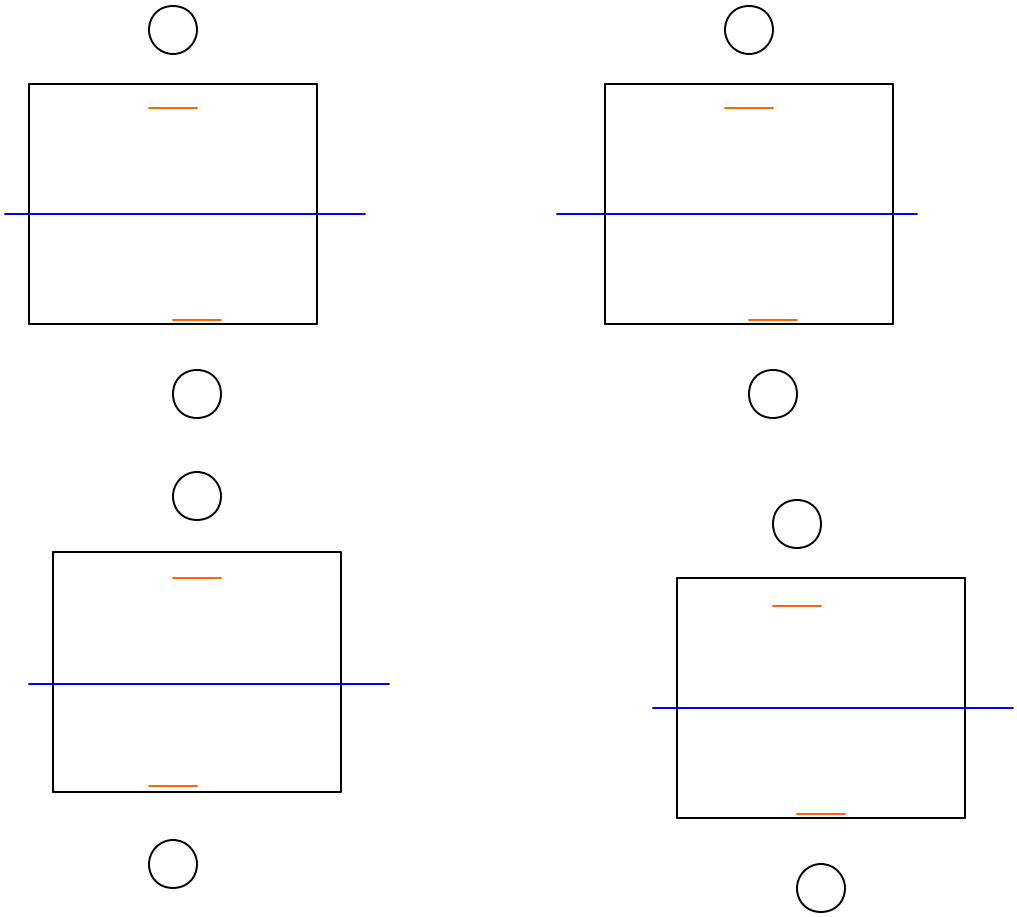
APPENDIX L

EXAMPLE OF FLASHCARDS USED DURING TRAINING

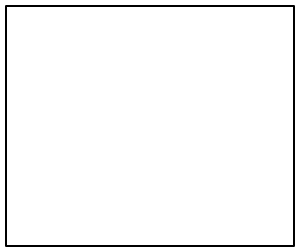


APPENDIX M

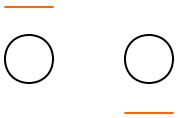
PLAN OF TEST ROOMS



The boxes set up between the participants to keep them from copying



Table



Participants (the red line indicates the way they are facing)

APPENDIX N

VERBATIM AFRIKAANS OF THE PRE-TEST TRAINING

Vandag gaan ons ‘n speletjie speel met woorde en prentjies. Voordat ons begin moet julle eers vir my wys of julle weet hoe om ‘n kruisie te teken. Kom ons probeer. Dis reg, trek ‘n strepie so en dan nog ‘n strepie so (navorser demonstreer op ‘n los vel papier en deelnemers oefen op ‘n aparte bladsy). Haal die pen se doppie af en oefen ‘n paar kruisies op die los bladsy. Dis baie goed, sit nou weer die doppie op die pen en sit die pen neer.

Saam met die bladsy en pen het julle ook ‘n boek gekry. Kom ons kyk na die prentjies op die eerste bladsy van die boek. Ek wil hê julle moet na elke prentjie op die bladsy kyk. Wys met jou vinger na die prentjies as jy na hulle kyk (navorser demonstreer). Julle moet mooi kyk. Kyk na al die prentjies. (Deelnemers kry ongeveer ‘n minuut om na die prentjies te kyk.)

Klaar gekyk! Haal die pen se doppie af en sit dit agter op die pen. Los die doppie daar tot ons klaar is. Julle sal sien dat die hoekies van die boek se bladsye omgevou is. Dit is om julle te help om een bladsy op ‘n slag om te blaai. Julle moet net een bladsy op ‘n slag omblaai, wanneer ek gesê het: “reg so”

Nou moet julle mooi luister: ek gaan ‘n woord sê, kyk op die bladsy na al die prentjies en besluit watter prentjie is die woord wat ek gesê het se maatjie. Trek nou ‘n kruis oor die prentjie. Ek gaan julle met die eerste een help:

Die eerste woord is **Sambreel.** Kyk, ek kyk na al die prentjies (navorser wys met vinger na al die prentjies). Ek dink hierdie een is sy maatjie, nou trek ek ‘n kruisie oor die prentjie. Sit julle vingers by die prentjie en trek ‘n kruisie oor die prentjie. As ek sê reg so, moet julle die kruisie trek en omblaai.

Het almal die kruisie getrek? Reg so, blaai om.

2 Stoel (x3)

Reg so, blaai om.

Nou moet julle op julle eie probeer:

4 Kraan (x3)

Reg so, blaai om.

6 Roomys (x3)

Reg so, blaai om.

8 Skêr (x3)

Reg so, blaai om.

3 Muis (x3)

Reg so, blaai om.

5 Bal (x3)

Reg so, blaai om.

7 Oë (x3)

Reg so, blaai om.

APPENDIX O

ENGLISH TRANSLATION OF THE PRE-PEST TRAINING

Today we are going to play a game with words and pictures. Before we begin I want you to show me if you know how to draw a cross. Let's try. That's right, draw a line like this and another line like that (R demonstrates on a page), take the cap off the pen and practise a few crosses on the separate page (Ps practise on a separate page).

That is very good, put the cap back on the pen and put the pen down.

Together with your page and pen you also received a book. Let us look at the first page of the book. I want you to look at each picture on the page. You must point with your finger as you look at the pictures (R demonstrates). You must look carefully. Look at all the pictures. (The participants have about a minute to look at the pictures).

Finished! Take the cap off your pen and place it on the back. Leave it there until we have finished. You will see that the corners of the pages of the book are folded over. This is to help you to turn one page at a time. You must turn only one page at a time, and only when I've said: that's fine".

Now you have to listen carefully, I am going to say a word. Look at all the pictures on the page and decide which picture belongs to the word I've said. Mark the one you've chosen with a cross. I will help you with the first one

The first word is **Umbrella**. Look, I take a look at all the pictures (R looks at all the pictures, she tracks with her finger to demonstrate looking at all the pictures). I think this picture belongs with that word and I mark it with a cross. Point to the mark and indicate it with a cross. If I say that is fine, you must mark with a cross and turn the page. Have you all finished? That's fine, turn the page.

2 Chair (x3)

That's fine, turn the page.

Now you must try it on your own:

3 Mouse (x3)

That's fine, turn the page.

4 Tap (x3)

That's fine, turn the page.

5 Ball (x3)

That's fine, turn the page.

6 Ice-cream (x3)

That's fine, turn the page.

7 Eyes (x3)

That's fine, turn the page.

8 Scissors (x3)

That's fine, turn the page.

APPENDIX P

VERBATIM AFRIKAANS OF THE PRE-TEST TESTING

Goed, kom ons kyk nou na hierdie bladsy. Hier is ander prentjies op. Ek wil hê julle moet weer na al die prentjies kyk. Wys weer met jou vinger terwyl jy na die prentjies kyk. Moenie iets skryf voordat ek nie sê julle mag nie. (Deelnemers kry ongeveer ‘n minuut om na die prentjies te kyk.)

Hiedie prentjies lyk ‘n bietjie anders as die vorige prentjies. Hierdie keer wil ek hê elkeen moet alleen werk. Julle moet mooi kyk watter prentjie julle dink die maatjie is van die woorde wat ek sê. Daar is nie ‘n regte of verkeerde antwoord nie, jy moet net besluit watter prentjie jy dink die maatjie van die woord is wat ek gesê het.

As jy die woord se maatjie sien trek ‘n kruisie oor die prentjie en wag totdat ek sê julle kan omblaai. As jy dink ‘n prentjie het meer as een maatjie kan jy hom meer as een keer kies. Onthou julle moet mooi luister en mooi kyk voordat julle kies.

Ek gaan die woorde 3 keer sê voor ons gaan omblaai. Kom ons begin. Die eerste een:

1 (9) Laat ek. (x3)
Reg so, blaai om.

2 (10) Dankie. (x3)
Reg so, blaai om.

3 (11) Moet dit trek. (x3)
Reg so, blaai om.

4 (12) Sit dit in die wasgoedmandjie. (x3)
Reg so, blaai om.

5 (13) Kom ons haal dit af. (x3)
Reg so, blaai om.

6 (14) Moet dit terugvou. (x3)
Reg so, blaai om.

7 (15) Dit is skeef. (x3)
Reg so, blaai om.

8 (16) Moet dit omruil. (x3)
Reg so, blaai om.

9 (17) Moet dit invou. (x3)
Reg so, blaai om.

10 (18) Dit is vuil. (x3)
Reg so, blaai om.

11 (19) Uh-oh. (x3)
Reg so, blaai om.

12 (20) Lyk goed. (x3)
Reg so, blaai om.

13 (21) Moenie. (x3)
Reg so, blaai om.

14 (22) Help my, asseblief. (x3)
Reg so, blaai om.

15 (23) Wat ‘n gemors. (x3)

Reg so, blaai om.

Nou vir die laaste een:

16 (24) Laat ons die bed opmaak. (x3)

Goed, nou is ons klaar. Dankie dat julle so mooi saam met my gekyk het. Julle kan nou maar die doppie terug sit op die pen.

APPENDIX Q

ENGLISH TRANSLATION OF THE PRE-TEST TESTING

That's fine. Now we are going to look at this page. Here we have different pictures. I want you to look at all these pictures. You must point to the pictures as you look at them. Do not write anything before I say you can. (participants have about a minute to look at the pictures).

These pictures are different from the previous pictures. This time I want each of you to work on your own. You must look carefully before deciding with picture belongs to the word that I've said. There is no correct or incorrect answer; you have to decide which picture you think belongs to word I said.

If you see the picture that belongs to the word, please mark it with a cross and wait until I say you can turn the page. If you think a picture belongs to more than one word, you can choose it more than once. Remember: you will have to listen and look carefully before you choose.

I will say each word three times before we will turn the page. Let's get started. The first one:

1 (9) Let me. (x3)
That's fine, turn the page.

2 (10) Thank you. (x3)
That's fine, turn the page.

3 (11) Need to pull it. (x3)
That's fine, turn the page.

4 (12) Put it in the hamper. (x3)
That's fine, turn the page.

5 (13) Let's take this off. (x3)
That's fine, turn the page.

6 (14) Have to fold it back. (x3)
That's fine, turn the page.

7 (15) It's crooked. (x3)
That's fine, turn the page.

8 (16) Need to change them. (x3)
That's fine, turn the page.

9 (17) Got to tuck it in. (x3)
That's fine, turn the page.

10 (18) They're dirty. (x3)
That's fine, turn the page.

11 (19) Uh-oh. (x3)
That's fine, turn the page.

12 (20) Looks good. (x3)
That's fine, turn the page.

13 (21) No. (x3)

14 (22) Help me, please. (x3)

That's fine, turn the page.

That's fine, turn the page.

15 (23) What a mess! (x3)

That's fine, turn the page.

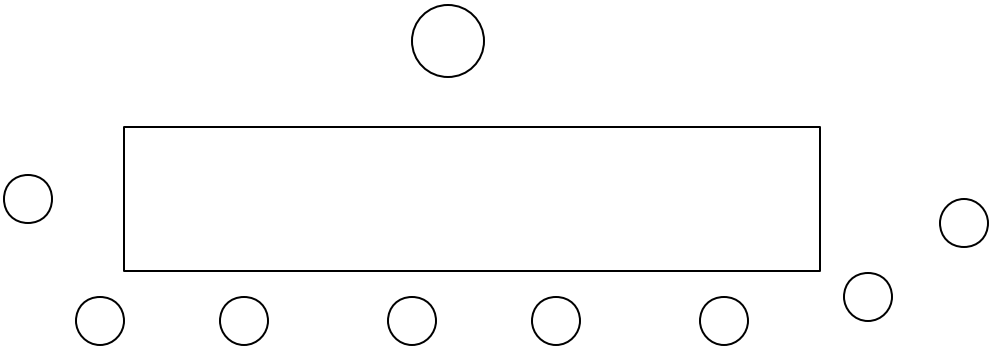
16 (24) Let's get the bed made. (x3)

That's fine, turn the page.

There we go. Now we have finished. Thank you your co-operation. You can place the cap back on the pen.

APPENDIX R

PLAN OF THE TRAINING SESSIONS



RESEARCHER

PARTICIPANTS

APPENDIX S:

VERBATIM AFRIKAANS OF THE TRAINING

Vandag gaan ek vir julle vertel wat die prentjies waarmee ons gister gespeel het beteken.

Julle het elkeen ‘n papier gekry met dieselfde prentjies waarmee ons gister gespeel het (elke deelnemer kry ‘n afdruk van die toetsbladsy; die bladsye word ingeneem wanneer die sessie verby is).

Hier by my het ek groot prente. Kom ons kyk (navorser het flitsbladsye wat elk een simbool bevat; die simbole word ry vir ry van links na regs aan die deelnamers verduidelik). Julle kan met julle vingers op julle papier wys na die prentjie waaroor ek praat.

1 Hierdie prentjie beteken: **LAAT EK**
Kyk, die mannetjie wys na homself en sê “**LAAT EK”**
(Blaai na volgende flitsbladsy).

2 Hierdie prentjie beteken: **KOM ONS HAAL DIT AF**
Kyk, die mannetjie haal sy hoed af en sê: “**KOM ONS HAAL DIT AF”**
(Blaai na volgende flitsbladsy).

3 Hierdie prentjie beteken: **MOET DIT OMRUIL**
Kyk, dit verander. Ons “**MOET DIT OMRUIL”**
(Blaai na volgende flitsbladsy).

4 Hierdie prentjie beteken: **DIT IS SKEEF**
Kyk, die een stokkie is skeef. “**DIT IS SKEEF”**
(Blaai na volgende flitsbladsy).

5 Hierdie prentjie beteken: **MOENIE**.
Kyk, die mannetjie skud sy kop en sê: “**MOENIE”**
(Blaai na volgende flitsbladsy).

6 Hierdie prentjie beteken: **LAAT ONS DIE BED OPMAAK**
Kyk, die mannetjie maak die bed bed op, hy sê “**LAAT ONS DIE BED OPMAAK”**
(Blaai na volgende flitsbladsy).

7 Hierdie prentjie beteken: **LYK GOED**
Kyk, die hand wys: **“LYK GOED”**
(Blaai na volgende flitsbladsy).

8 Hierdie prentjie beteken: **MOET DIT INVOU**
Kyk die pyltjie wys in. “**MOET DIT INVOU”**
(Blaai na volgende flitsbladsy).

9 Hierdie prentjie beteken: **UH-OH**
Kyk, die mannetjie trek sy oë en mond groot oop en sê: **“UH-OH”**
(Blaai na volgende flitsbladsy).

10 Hierdie prentjie beteken: **MOET DIT TREK**
Kyk, die mannetjie trek die klip, hy sê “**MOET DIT TREK”**
(Blaai na volgende flitsbladsy).

11 Hierdie prentjie beteken: **DIT IS VUIL**
Kyk, daar is vuil kolletjies op. "**DIT IS VUIL"**
(Blaai na volgende flitsbladsy).

12 Hierdie prentjie beteken: **WAT 'N GEMORS!**
Kyk, iemand het die verf omgestamp: "**WAT 'N GEMORS!"**
(Blaai na volgende flitsbladsy).

13 Hierdie prentjie beteken: **DANKIE**
Kyk, die mannetjie wys met sy hande: "**DANKIE"**
(Blaai na volgende flitsbladsy).

14 Hierdie prentjie beteken: **HELP MY ASSEBLIEF**
Kyk, die een hand help die ander hand. "**HELP MY ASSEBLIEF"**
(Blaai na volgende flitsbladsy).

15 Hierdie prentjie beteken: **MOET DIT TERUGVOU**
Kyk hierdie papier word teruggevou. "**MOET DIT TERUGVOU"**
(Blaai na volgende flitsbladsy).

16 Hierdie prentjie beteken: **SIT DIT IN DIE WASGOEDMANDJIE**
Kyk, die wasgoed is in die wasgoedmandjie. "**SIT DIT IN DIE WASGOEDMANDJIE"**

Goed, kom ons kyk nog een keer na die prente en wat hulle beteken. Julle kan dit nou hardop saam met my sê as julle wil.

Die hele proses word nou herhaal, die deelnemers kry die geleentheid om die betekenis hardop saam met die navorser te herhaal – volg presies dieselfde bewoording)

Goed, nou het ons klaar gekyk. Julle kan nou maar gaan. Los asseblief die prentjies hier by my.

APPENDIX T

ENGLISH TRANSLATION OF THE TRAINING

Today I am going to explain the meaning of the pictures we played with yesterday.

Each of you received a page with the pictures we used. (each participant receives a copy of the grid.)

I have big pictures. Let us have a look. (researcher has 16 A4 sized flashcards, each containing one of the symbols. The symbols are explained in the grid order from left to right, top to bottom.) You can point to the symbols on the page in front of you.

1 This picture means: **LET ME**
Look, he points to himself and says: **"LET ME"**

2 This picture means: **LET'S TAKE THIS OFF**
Look, he is taking off his hat and says: **"LET'S TAKE THIS OFF"**

3 This picture means: **NEED TO CHANGE THEM**
Look, it changes. "**NEED TO CHANGE THEM"**

4 This picture means: **IT'S CROOKED**
Look one of the sticks is crooked: **"IT'S CROOKED"**

5 This picture means: **NO**
Look, the man shakes his head and says: **"NO"**

6 This picture means: **LET'S GET THE BED MADE**
Look, he is making his bed and says: **"LET'S GET THE BED MADE"**

7 This picture means: **LOOKS GOOD**
Look, the hand shows: **"LOOKS GOOD"**

8 This picture means: **GOT TO TUCK IT IN**
Look, the arrow points inside. **" GOT TO TUCK IT IN"**

9 This picture means: **UH-OH**
Look, he widens his eyes and mouth and says: **"UH-OH"**

10 This picture means: **NEED TO PULL IT**
Look, he is pulling the rock and says: **"NEED TO PULL IT"**

11 This picture means: **THEY'RE DIRTY**
Look at the dirty spots. **"THEY'RE DIRTY"**

12 This picture means: **WHAT A MESS!**
Look, somebody overturned the paint. **"WHAT A MESS!"**

13 This picture means: **THANK YOU**
Look, the man points with his hands: **"THANK YOU"**

14 This picture means: **HELP ME, PLEASE**
Look, the one hand helps the other hand: **"HELP ME, PLEASE"**

15 This picture means: **HAVE TO FOLD IT BACK**
Look, they fold back the page. **"HAVE TO FOLD IT BACK"**

16 This picture means: **PUT IT IN THE HAMPER**
Look, all the washing is in the hamper. **"PUT IT IN THE HAMPER"**

Well done, let's go through them one more time. You can repeat them with me.

(The whole process is repeated, and the participants have the opportunity to repeat the meaning of the words).

Well done, now we have finished. You can go now. Please leave the pages on the table.

APPENDIX U

VERBATIM AFRIKAANS OF THE POST-TEST TESTING

Vandag gaan ons weer die speletjie speel wat ons Maandag/Dinsdag gespeel het. Kan julle nog onthou? Kom ons oefen weer met die eerste prentjies. Kyk weer na die prentjies. Wys met jou vinger terwyl jy kyk. Julle moet onthou om mooi te kyk. Kyk na al die prentjies. (Deelnemers kry ongeveer 'n minuut om na die prentjies te kyk.)

Klaar gekyk! Haal die doppie van die pen af en sit dit agter op. Los die doppie daar totdat ons klaar is. Nou moet julle mooi luister: ek gaan 'n word sê. Kyk op die papier na al die prentjies en besluit watter prentjie is die woord wat ek gesê het se maatjie. Trek nou 'n kruis oor die prentjie.

1 Sambreel (x3)
Reg so, blaai om.
3 Muis (x3)
Reg so, blaai om.
5 Bal (x3)
Reg so, blaai om.
7 Oë (x3)
Reg so, blaai om.

2 Stoel (x3)
Reg so, blaai om.
4 Kraan (x3)
Reg so, blaai om.
6 Roomys (x3)
Reg so, blaai om.
8 Skêr (x3)
Reg so, blaai om.

Goed, nou kyk ons weer na hierdie hierdie bladsy met die ander prentjies. Moenie iets skryf voordat ek nie sê julle mag nie.

Julle moet mooi kyk watter prentjie julle dink die maatjie is van die woord wat ek sê. Elkeen van julle moet self besluit en moenie dat die ander by jou afkyk nie. Onthou jy moet besluit watter prentjie jy dink die maatjie is van die woord is wat ek gesê het. (*Kontrole groep: onthou daar is nie 'n reg of verkeerd nie. As jy 'n ander prentjie wil kies as Maandag mag jy maar.* Eksperimentele groep: as jy nie mooi kan onthou nie, kan jy maar die een kies wat jy dink die beste pas.)

As jy die woord se maatjie sien trek 'n kruisie oor die prentjie en wag totdat ek sê julle kan omblaai. Onthou julle moet mooi luister en mooi kyk voordat julle kies.

Ek gaan die woorde 3 keer sê voor ons gaan omblaai. Kom ons begin. Die eerste een:

1 (9) Laat ek. (x3)
Reg so, blaai om.

2 (10) Dankie. (x3)
Reg so, blaai om.

3 (11) Moet dit trek. (x3)
Reg so, blaai om.

4 (12) Sit dit in die wasgoedmandjie. (x3)
Reg so, blaai om.

5 (13) Kom ons haal dit af. (x3)
Reg so, blaai om.

6 (14) Moet dit terugvou. (x3)
Reg so, blaai om.

7 (15) Dit is skeef. (x3)
Reg so, blaai om.

8 (16) Moet dit omruil. (x3)
Reg so, blaai om.

9 (17) Moet dit invou. (x3)
Reg so, blaai om.

10 (18) Dit is vuil. (x3)
Reg so, blaai om.

11 (19) Uh-oh. (x3)
Reg so, blaai om.

12 (20) Lyk goed. (x3)
Reg so, blaai om.

13 (21) Moenie. (x3)
Reg so, blaai om.

14 (22) Help my, asseblief. (x3)
Reg so, blaai om.

15 (23) Wat 'n gemors. (x3)
Reg so, blaai om.

Nou vir die laaste een:

16 (24) Laat ons die bed opmaak. (x3)
Goed, nou is ons klaar. Dankie dat julle so mooi saam met my gekyk het.

APPENDIX V

ENGLISH TRANSLATION OF THE POST-TEST TESTING

Today we are going to play the same game as on Monday/Tuesday/ Wednesday. Can you still remember? Let's practise with the first pictures. Look at the pictures once more. You must point with your finger as you look at the pictures. You must remember to look carefully. Look at all the pictures. (participants have about a minute to look at the pictures).

Finished! Take the cap off your pen and place it on the back. Leave it there until we have finished. Now you have to listen carefully, I am going to say a word. Look at all the pictures on the page and decide which picture belongs to the word I've said. Mark the one you've chosen with a cross.

1 Umbrella (x3)
That's fine, turn the page.
2 Chair (x3)
That's fine, turn the page.
3 Mouse (x3)
That's fine, turn the page.
4 Tap (x3)
That's fine, turn the page.
5 Ball (x3)
That's fine, turn the page.
6 Ice-cream (x3)
That's fine, turn the page.
7 Eyes (x3)
That's fine, turn the page.
8 Scissors (x3)
That's fine, turn the page.

That's good. Now we are going to look at this page with the other pictures. Do not write anything before I say you can. (participants have about a minute to look at the pictures).

You must look carefully before deciding which picture belongs to the word that I've said. You must each decide on his/her own and not let the others see your work. You must decide which picture belongs to the word I've said.

If you see the picture that belongs to the word, please mark it with a cross and wait until I say you can turn the page. Remember that you will have to listen and look carefully before you choose.

I will say each word three times before we will turn the page. Let's get started. The first one:

1 (9) Let me. (x3)
That's fine, turn the page.
2 (10) Thank you. (x3)
That's fine, turn the page.

3 (11) Need to pull it. (x3)
That's fine, turn the page.

4 (12) Put it in the hamper. (x3)
That's fine, turn the page.

5 (13) Let's take this off. (x3)
That's fine, turn the page.

6 (14) Have to fold it back. (x3)
That's fine, turn the page.

7 (15) It's crooked. (x3)
That's fine, turn the page.

8 (16) Need to change them. (x3)
That's fine, turn the page.

9 (17) Got to tuck it in. (x3)
That's fine, turn the page.

10 (18) They're dirty. (x3)
That's fine, turn the page.

11 (19) Uh-oh. (x3)
That's fine, turn the page.

12 (20) Looks good. (x3)
That's fine, turn the page.

13 (21) No. (x3)
That's fine, turn the page.

14 (22) Help me, please. (x3)
That's fine, turn the page.

15 (23) What a mess! (x3)
That's fine, turn the page.

16 (24) Let's get the bed made. (x3)
That's fine, turn the page.

There we go. Now we have finished. Thank you your co-operation. You can put the cap back on the pen.

APPENDIX W

A TABLE INDICATING THE PERCENTAGE POINT DIFFERENCES BETWEEN THE RESULTS OF THE EXPERIMENTAL GROUP'S PRE- AND POST-TEST RESULTS

Symbol number	Pre-test result	Post-test result	Difference in percentage points
1	21	75	54
2	8	63	54
3	25	71	46
4	29	75	46
5	42	75	33
6	92	100	8
7	4	54	50
8	25	57	32
9	83	100	17
10	63	92	29
11	17	71	53
12	43	91	48
13	42	67	25
14	13	88	74
15	26	54	28
16	67	100	33

APPENDIX X

A TABLE INDICATING THE PERCENTAGE POINT DIFFERENCES BETWEEN THE RESULTS OF THE CONTROL GROUP'S PRE- AND POST-TEST RESULTS

Symbol number	Pre-test result	Post-test result	Difference in percentage points
1	59	57	- 2
2	18	5	- 13
3	9	18	9
4	36	36	0
5	45	55	9
6	82	86	5
7	0	9	9
8	14	18	5
9	73	91	18
10	64	77	14
11	36	36	0
12	40	73	33
13	29	18	- 10
14	27	14	- 14
15	23	32	9
16	77	95	18

APPENDIX Y

BODY OF DATA: COMBINED PRE-TEST RESULTS

ph	Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**1**	***18***	4	0	0	5	3	0	1	9	0	0	0	3	1	1	1
		39	*9*	*0*	*0*	*11*	*7*	*0*	*2*	*20*	*0*	*0*	*0*	*7*	*2*	*2*	*2*
2	**5**	1	***6***	2	3	0	10	0	4	1	1	0	3	2	0	9	4
		2	***13***	*4*	*7*	*0*	*20*	*0*	*9*	*2*	*2*	*0*	*7*	*4*	*0*	*20*	*9*
3	**8**	3	4	***8***	0	5	4	1	3	0	3	2	1	2	5	5	0
		7	*9*	***17***	*0*	*11*	*9*	*2*	*7*	*0*	*7*	*4*	*2*	*4*	*11*	*11*	*0*
4	**7**	0	5	3	***15***	2	0	1	3	1	1	2	4	2	3	3	1
		0	*11*	*7*	***33***	*2*	*0*	*2*	*7*	*2*	*2*	*4*	*9*	*4*	*7*	*7*	*2*
5	**13**	3	2	0	0	***20***	1	6	0	4	0	1	1	4	4	0	0
		7	*4*	*0*	*0*	***43***	*2*	*13*	*0*	*9*	*0*	*2*	*2*	*9*	*9*	*0*	*0*
6	**16**	0	1	0	1	1	***40***	0	1	0	0	0	1	0	0	1	0
			2	*0*	*2*	*2*	***87***	*0*	*2*	*0*	*0*	*0*	*2*	*0*	*0*	*27*	*0*
7	**12**	10	9	1	1	1	0	***1***	2	2	2	1	0	12	2	0	1
		22	*20*	*2*	*2*	*2*		***2***	*4*	*4*	*4*	*2*		*27*	*4*		*2*
8	**9**	2	0	6	2	1	5	0	***9***	1	2	1	1	1	3	10	2
		4	*0*	*13*	*4*	*2*	*11*	*0*	***20***	*2*	*4*	*2*	*2*	*2*	*7*	*22*	*4*
9	**11**	0	3	0	0	3	0	1	0	***36***	2	1	0	0	0	0	0
		0	*7*	*0*	*0*	*7*	*0*	*2*	*0*	***78***	*4*	*2*	*0*	*0*	*0*	*0*	*0*
10	**3**	0	1	4	0	4	0	1	0	2	***29***	0	2	1	0	2	0
		0	*2*	*9*	*0*	*9*	*0*	*2*	*0*	*4*	***63***	*0*	*4*	*2*	*0*	*4*	*0*
11	**10**	1	0	1	0	2	1	0	0	1	0	***12***	20	2	0	1	4
		2	*0*	*2*	*0*	*4*	*2*	*0*	*0*	*2*	*0*	***27***	*44*	*4*	*0*	*2*	*9*
12	**15**	0	1	4	2	2	1	5	3	0	1	4	***19***	0	3	1	0
		0	*2*	*9*	*2*	*4*	*2*	*11*	*7*	*0*	*2*	*9*	***42***	*0*	*7*	*2*	*0*
13	**2**	5	10	0	1	4	1	1	0	4	0	0	0	***16***	3	0	0
		11	*22*	*0*	*2*	*9*	*2*	*2*	*0*	*9*	*0*	*0*	*0*	***36***	*7*	*0*	*0*
14	**14**	2	1	0	1	5	4	6	1	2	6	2	0	5	***9***	0	1
		4	*2*	*0*	*2*	*11*	*9*	*13*	*2*	*4*	*13*	*4*	*0*	*11*	***20***	*0*	*2*
15	**6**	1	0	8	1	1	11	0	2	0	1	5	1	0	0	***11***	3
		2	*0*	*18*	*2*	*2*	*24*	*0*	*4*	*0*	*2*	*11*	*2*	*0*	*0*	***24***	*7*
16	**4**	0	1	0	1	0	1	0	1	0	0	4	5	0	0	0	***33***
		0	*2*	*0*	*2*	*0*	*2*	*0*	*2*	*0*	*0*	*9*	*11*	*0*	*0*	*0*	***72***

The accuracy score for each symbol is denoted in bold and color.

Ph - Phrase number

Q – Question number

APPENDIX Z

BODY OF DATA: EXPERIMENTAL GROUP PRE- AND POST-TEST RESULTS

Experimental pre-test

ph	Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**1**	***5***	3	0	0	4	2	0	1	4	0	0	0	2	1	1	1
		21	13			17	8		4	17				8	4	4	4
2	**5**	1	***2***	2	2	0	3	0	2	0	0	0	2	1	0	6	3
		4	***8***	8	8		13		8				8	4		25	13
3	**8**	2	2	***6***	0	4	1	1	2	0	1	0	0	2	1	2	0
		8	8	***25***		17	4	4	8		4			8	4	8	
4	**7**	0	2	1	***7***	1	0	1	2	1	1	2	2	1	3	0	0
			8	4	***29***	4		4	8	4	4	8	8	4	13		
5	**13**	1	1	0	0	***10***	0	5	0	1	0	1	1	1	3	0	0
		4	4			***42***		21		4		4	4	4	13		
6	**16**	0	0	0	0	1	***22***	0	0	0	0	0	0	0	0	1	0
						4	***92***									4	
7	**12**	7	2	1	1	0	0	***1***	0	2	1	1	0	4	2	0	1
		30	9	4	4			***4***		9	4	4		17	9		4
8	**9**	2	0	3	1	1	2	0	***6***	0	1	1	0	0	1	4	2
		8		13	4	4	8		***25***		4	4			4	17	8
9	**11**	0	2	0	0	0	0	0	0	***20***	1	1	0	0	0	0	0
			8							***83***	4	4					
10	**3**	0	1	1	0	4	0	0	0	1	***15***	0	0	0	0	2	0
			4	4		17				4	***63***					8	
11	**10**	1	0	1	0	1	0	0	0	0	0	***4***	13	0	0	1	2
		4		4		4						***17***	57			4	9
12	**15**	0	0	2	1	1	0	4	1	0	0	3	***10***	0	1	0	0
				8	4	4		17	4			13	***43***		4		
13	**2**	1	5	0	1	1	1	1	0	3	0	0	0	***10***	1	0	0
		4	21		4	4	4	4		13				***42***	4		
14	**14**	2	0	0	0	4	2	1	1	1	5	0	0	3	***3***	0	1
		9				17	9	4	4	4	22			13	***13***		4
15	**6**	1	0	1	0	1	8	0	1	0	1	2	0	0	0	***6***	2
		4		4		4	35		4		4	9				***26***	9
16	**4**	0	1	0	0	0	1	0	0	0	0	2	4	0	0	0	***16***
			4				4					8	17				***67***

The accuracy score for each symbol is denoted in bold and color.

Ph - Phrase number
Q – Question number

Experimental post-test

ph	Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**1**	***18***	1	0	0	0	0	1	0	1	0	0	0	3	0	0	0
		75	4					4		4				13			
2	**5**	1	***15***	1	1	2	2	1	0	0	0	0	0	0	0	1	0
		4	***63***	4	4	8	8	4								4	
3	**8**	0	0	***17***	0	1	0	1	1	1	0	0	0	0	2	1	0
				71		4		4	4	4					8	4	
4	**7**	0	2	0	***18***	0	0	0	0	0	0	2	0	0	1	1	0
			8		***75***							8			4	4	
5	**13**	1	1	0	0	***18***	0	1	0	1	0	0	0	1	1	0	0
		4	4			***75***		4		4				4	4		
6	**16**	0	0	0	0	0	***24***	0	0	0	0	0	0	0	0	0	0
							100										
7	**12**	5	0	0	0	1	0	***13***	0	1	0	0	0	4	0	0	0
		21				4		***54***		4				17			
8	**9**	0	0	1	0	0	1	0	***13***	0	0	0	0	0	0	7	1
				4			4		***57***							30	4
9	**11**	0	0	0	0	0	0	0	0	***24***	0	0	0	0	0	0	0
										100							
10	**3**	0	0	0	1	0	0	0	1	0	***22***	0	0	0	0	0	0
					4				4		***92***						
11	**10**	0	0	0	0	0	0	0	0	0	0	***17***	7	0	0	0	0
												71	29				
12	**15**	0	0	0	0	0	0	0	0	0	0	2	***21***	0	0	0	0
												9	***91***				
13	**2**	1	2	0	0	2	0	1	0	1	1	0	0	***16***	0	0	0
		4	8			8		4		4	4			***67***			
14	**14**	0	1	0	0	0	0	0	0	0	1	0	0	1	***21***	0	0
			4								4			4	***865***		
15	**6**	0	0	2	0	0	4	1	3	0	1	0	0	0	0	***13***	0
				8			17	4	13		4					***54***	
16	**4**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	***24***
																	100

The accuracy score for each symbol is denoted in bold and color.
Ph - Phrase number
Q – Question number

APPENDIX AA

BODY OF DATA : CONTROL GROUP PRE- AND POST-TEST RESULTS

Control pre-test

ph	Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1	***13***	1	0	0	1	1	0	0	5	0	0	0	1	0	0	0
		59	5			5	5			23				5			
2	5	0	***4***	0	1	0	7	0	2	1	1	0	1	1	0	3	1
			18		5		32		9	5	5		5	5		14	5
3	8	1	2	***2***	0	1	3	0	1	0	2	2	1	0	4	3	0
		5	9	***9***		5	14		5		9	9	5		18	14	
4	7	0	3	2	***8***	1	0	0	1	0	0	0	2	1	0	3	1
			14	9	***36***	5			5				9	5		14	5
5	13	2	1	0	0	***10***	1	1	0	3	0	0	0	3	1	0	0
		9	5			***45***	5	5		14				14	5		
6	16	0	1	0	1	0	***18***	0	1	0	0	0	1	0	0	0	0
			5		5		82		5				5				
7	12	3	7	0	0	1	0	***0***	2	0	1	0	0	8	0	0	0
		14	32			5			9		5			36			
8	9	0	0	3	1	0	3	0	***3***	1	1	0	1	1	2	6	0
				14	4		14		***14***	5	5		5	5	9	27	
9	11	0	1	0	0	3	0	1	0	***16***	1	0	0	0	0	0	0
			5			14		5		***73***	5						
10	3	0	0	3	0	0	0	1	0	1	***14***	0	2	1	0	0	0
				14				5		5	***64***		9	5			
11	10	0	0	0	0	1	1	0	0	1	0	***8***	7	2	0	0	2
						5	5			5		***36***	32	9			9
12	15	0	1	2	0	1	1	1	2	0	1	1	***9***	0	2	1	0
			5	9		5	5	5	9		5	5	***41***		9	5	
13	2	4	5	0	0	3	0	0	0	1	0	0	0	***6***	2	0	0
		19	24			14				5				***29***	10		
14	14	0	1	0	1	1	2	5	0	1	1	2	0	2	***6***	0	0
			5		5	5	9	23		5	5	9		9	***27***		
15	6	0	0	7	1	0	3	0	1	0	0	3	1	0	0	***5***	1
				32	5		14		5			14	5			***23***	5
16	4	0	0	0	1	0	0	0	1	0	0	2	1	0	0	0	***17***
					5				5			9	5				***77***

The accuracy score for each symbol is denoted in bold and color.

Ph - Phrase number

Q – Question number

Control post-test

ph	Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**1**	***12***	0	0	0	0	0	1	1	2	0	0	0	5	0	0	0
		57						5	5	10				24			
2	**5**	0	***1***	1	2	0	4	0	3	1	2	2	0	1	0	4	1
			5	5	9		18		14	55	9	9		5		18	5
3	**8**	1	1	***4***	2	1	2	3	1	1	0	0	1	1	2	2	0
		5	5	***18***	9	5	9	14	5	5			5	5	9	9	
4	**7**	0	5	1	***8***	2	0	0	1	1	0	0	2	0	0	2	0
			23	5	***36***	9			5	5			9			9	
5	**13**	1	1	1	0	***12***	0	0	0	1	0	0	0	3	3	0	0
		5	5	5		***55***				5				14	14		
6	**16**	1	0	0	0	0	***19***	0	1	0	0	0	0	1	0	0	0
		4.55					86.36		4.55					4.55			
7	**12**	4	5	0	0	0	0	***2***	1	1	0	0	0	8	1	0	0
		18	23					***9***	5	5				36	5		
8	**9**	0	0	1	1	1	3	1	***4***	1	0	3	0	0	1	5	1
				5	5	5	14	5	***18***	5		14			5	23	5
9	**11**	0	1	0	0	0	0	1	0	***20***	0	0	0	0	0	0	0
			5					5		***91***							
10	**3**	0	0	2	0	2	0	0	0	0	***17***	0	1	0	0	0	0
				9		9					***77***		5				
11	**10**	0	1	1	0	0	0	0	0	0	0	***8***	8	0	0	1	3
			5	5								***36***	36			5	14
12	**15**	0	1	1	0	1	1	0	0	0	0	1	***16***	1	0	0	0
			5	5		5	5					5	***73***	5			
13	**2**	3	6	0	0	2	1	0	0	3	0	0	0	***4***	3	0	0
		14	27			9	5			14				***18***	14		
14	**14**	2	1	0	0	3	4	1	1	2	1	0	0	4	***3***	0	0
		9	5			14	18	5	5	9	5			18	***14***		
15	**6**	0	0	4	0	0	5	0	1	0	0	2	0	0	3	***7***	0
				18			23		5			9			14	***32***	
16	**4**	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	***21***
												5					***95***

The accuracy score for each symbol is denoted in bold and color.

Ph - Phrase number

Q – Question number