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The effect of dual versus mono medium teaching on the ability of bilingual, typically developing children to label graphic symbols in two languages

by

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ABSTRACT

A large portion of the world's population is multilingual. This trend is reflected in the population with communication disorders, and therefore in people with complex communication needs (CCN). People with CCN may need alternative and augmentative communication (AAC) systems to facilitate their participation in daily life. These systems are often related to the language of the person's community. Yet, if this person lives in a multilingual community, little current research is available to guide the design of AAC systems that give access to expression in more than one language. This pilot study aimed to determine the ability of typically developing Afrikaans-English bilingual children, between the ages of 4;6 (years;months) and 6;11, to label Picture Communication Symbols (PCS) in both these languages when taught with mono medium (English) versus dual medium (Afrikaans and English) teaching. Four participants, who spoke Afrikaans and English, were included in the study. A within-subjects crossover design was used. Each participant was taught two sets of symbols, one using mono medium and one dual medium teaching. Treatments were counterbalanced for order and set. Results tentatively showed that the teaching method was successful, with participants being able to label most symbols in English when taught in either mono (English) or dual medium. Participants were also able to label symbols in Afrikaans when taught the symbols by dual medium teaching. Some participants were spontaneously able to translate symbols taught by mono medium teaching (English) to Afrikaans. This pilot study tentatively suggests that this ability is dependent on the child's receptive vocabulary ability in both languages, as well as their ability to express the concepts depicted by the symbols in both L1 and L2. Future research is needed with studies that include a larger sample size, to be able to draw more robust conclusions.

Keywords: Alternative and augmentative communication (AAC), bilingual, children, dual medium teaching, mono medium teaching, multilingual, PCS, symbol labelling, typically developing.

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1. PROBLEM STATEMENT AND LITERATURE REVIEW

Augmentative and alternative communication (AAC) provides a means for people with limited verbal or written communication skills to be able to interact meaningfully with those around them and become integrated into their community (Beukelman & Mirenda, 2013; Blackstone, Williams, & Wilkins, 2007). AAC can be unaided, when the person uses their own body to produce a sign or gesture to convey the message, or aided, when the message is conveyed using an aid external to the body of the person conveying the message (Tönsing, Alant, & Lloyd, 2005). Von Tetzchner and Martinsen (2000) describe three groups of people who use AAC, namely the expressive, supportive and alternative language groups. The expressive language group shows a significant gap between the language they are able to understand and their ability to express themselves, therefore necessitating another permanent mode for them to express themselves adequately. Their receptive skills may be age appropriate or have some delay. For this group, the purpose of an AAC system is to facilitate expression, allowing the person using it to communicate with people around them, while the receptive mode for this group is typically spoken language. Such systems used mainly for expressive purposes are typically related to the language of the community within which the person using it resides, in order for them to be able to communicate with the people they interact with every day (Tönsing et al., 2005). It follows that persons who rely on AAC, who are receptively multilingual, would need access to different natural languages through AAC. As yet, there is very little research evidence to guide the design of AAC systems that give access to more than one natural language, or to understand the learning demands of such systems (Soto & Yu, 2014). Practitioners therefore have little evidence guiding their intervention practices with multilingual clients.

This study aims to explore how two different methods of teaching allow bilingual children to learn the association between a graphic symbol and a spoken word in two languages, to gain insight into one aspect of learning what the use of a bilingual graphic symbol-based AAC system requires. To frame the study, I will first discuss multilingual issues, including definitions and global trends. Next, I will discuss communication impairment in multilingual populations, and the multilingual South African context. AAC systems and how they give access to expression will be dealt with next, with particular focus on the way in which graphic symbol-based systems represent oral language, and the learning demands posed by such systems.

Considerations regarding AAC systems that give access to more than one language will be elucidated. Interventions that teach the association between a symbol and a spoken word or referent will be briefly reviewed, and a rationale given for the methods chosen in this study. Finally, learning vocabulary in an additional language will be discussed.

1.1 Multilingualism: Definitions and terminology

A large proportion of the world's population is multilingual (Jordaan, 2008; Winsler et al., 2014), that is, they regularly use two or more languages in their everyday lives (Grosjean, 1992 in Kay-Raining Bird, Genesee, & Verhoeven, 2016). This is also true for persons with communication disorders (Dukhovny & Kelly, 2015; Jordaan, 2008; McLeod, 2014; Williams & McLeod, 2012), including those in need of AAC (Soto & Yu, 2014). When describing people who use more than one language, various terms have been used, including 'bilingualism' and 'multilingualism', and authors have defined these in various ways. To provide clarity about the terminology use in this study, a list of terms and definitions is given in Table 1.

Table 1

Definition of terms

Term	Definition
Bilingual (multilingual)	People who use two (or more) languages in their everyday lives.
Simultaneous bilingualism	The person develops both languages at the same time, or begins the development of the second language soon after birth.
Sequential bilingualism	Development of the second language takes place after the first, generally agreed in research as after three years of age.
L1 and L2	L1 refers to the first language learnt. L2 refers to the second language learnt.

Source: Kay-Raining Bird et al., (2016)

The timing of bilingual exposure, as well as the amount of exposure to each language, affects the development of L2 (Kay-Raining Bird et al., 2016).

Simultaneous bilinguals generally achieve language milestones at the same time as monolingual peers. However, sequential bilinguals with intense, consistent exposure to L2 take two years to catch up to their monolingual peers with regard to conversational language skills and five to seven years for their academic language (Kay-Raining Bird et al., 2016). Generally it is reported that exposure to both languages should have a ratio of no less than 40% to 60%, that is exposure to L2 should occur at least 40% of the day, in order for the children's skills to be comparable to their monolingual peers (Kay-Raining Bird et al., 2016).

Traditionally bilingual teaching kept the languages separate. A child was taught L2 by being purely exposed to L2. However, newer research is suggesting that both languages used interchangeably, namely 'translanguaging', has a better impact on the child learning L2 (Creese & Blackledge, 2010; Perozzi & Sanchez, 1992).

1.2 Communication disorders in multilingual populations

As there is an increase in multilingualism globally, so a greater percentage of bilingual children are requiring intervention for communication disorders (Jordaan, 2008). The majority of children are treated monolingually, usually in the majority language of the area, which may not be their L1 (Jordaan, 2008). This is mainly due to the therapists only speaking one language, and a lack of resources to provide interpreters (Jordaan, 2008; Thordardottir, Cloutier, Ménard, Pelland-Blais, & Rvachew, 2015). However, this is contrary to best practice recommendations based on current research, which shows that language intervention is best conducted in all/both languages which the child uses (Soto & Yu, 2014; Thordardottir et al., 2015).

1.3 The South African context

South Africa has a diverse language and cultural heritage, with 11 official languages. Many South Africans have a home language other than English (see Figure 1), frequently living and interacting in multilingual communities. Although English is the home language of only 8.9% of South Africans (*South African Statistics*, 2012), it tends to be the lingua franca, dominating education, the business environment and the media (Kathard et al., 2011).

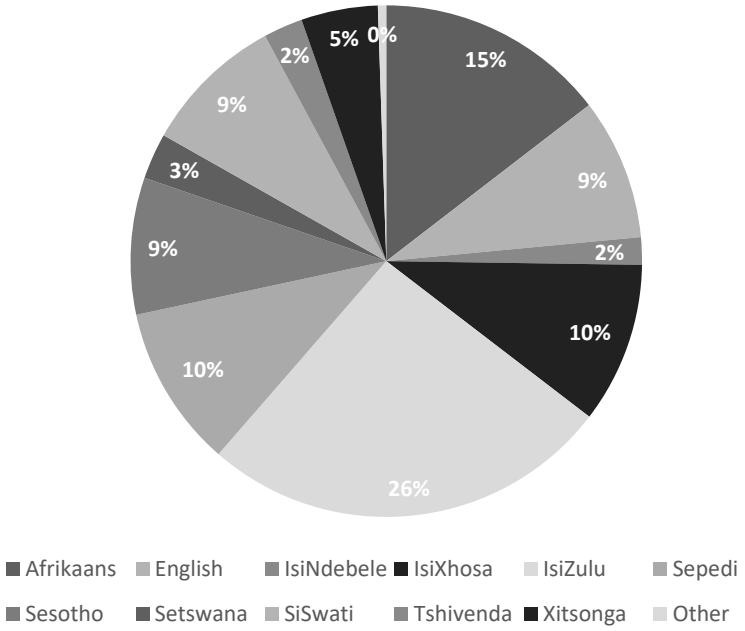


Figure 1. *Home languages in South Africa.*

Source: Statistics South Africa (2012)

The main language of instruction, especially at tertiary level where healthcare professionals are trained, is English. Many speech therapists find themselves in a situation when they need to provide intervention to a client who does not have the same L1 as them, or is bilingual (Mdlalo, Flack, & Joubert, 2016; Pillay & Kathard, 2015; Soto & Yu, 2014). Frequently, the therapist then treats the multilingual child in their L2, which may or may not be the language dominant to that community (Mdlalo et al., 2016).

1.4 AAC service provision for multilingual populations

AAC service providers are also required to serve populations that are increasingly diverse, including clients from multilingual backgrounds (Soto & Yu, 2014). By extrapolation from best practice guidelines for children with language impairment from bilingual backgrounds, AAC intervention should also support all languages that the client is exposed to and/or can comprehend (Soto & Yu, 2014). However, it has been suggested that this does not necessarily happen in practice (McCord & Soto, 2004; Tönsing, Van Niekerk, Schlünz, & Wilken, 2017). While there may be various reasons for this, one contributing aspect may be that learning demands of multilingual systems – and particularly graphic symbol-based systems –

are poorly understood (Soto & Yu, 2014). Service providers may therefore be uncertain about matching such systems to client skills, and about effective teaching strategies to teach the use of such systems.

To start using graphic symbol-based systems effectively, one of the skills that a person needs to develop is representational competence (Mollica, 2003). One aspect involves learning to map graphic symbols onto the concepts that they represent, in other words, learning to associate a graphic symbol on the AAC system with an environmental stimulus or referent (i.e., a concept).

When this person has a good understanding of spoken language, it seems possible (and maybe desirable) that this process can be mediated through spoken language – if the person understands of the meaning of a spoken word (i.e., has mapped a spoken word onto a concept), the person may come to learn to map the symbol onto a concept by being taught to map the symbol onto a spoken word (see Figure 2).

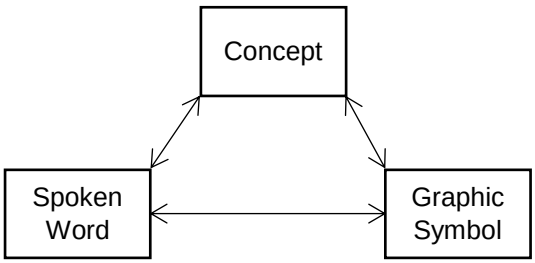


Figure 2. *Proposed link between spoken word, concept and graphic symbol.*

By purposefully teaching the link between a graphic symbol and a spoken word, graphic symbols may come to be used in a manner that more closely mirrors spoken output, thereby increasing congruence between a person's input and output modalities (Smith, 2006).

When a person understands more than one language, it would seem desirable that certain graphic symbols map onto more than one spoken language. This would be especially desirable for words that share a great number of common conceptual representations – those words commonly regarded as 'directly translatable' between languages. The question arises as to how an association between a graphic symbol and spoken words in two different languages may best be learnt and taught. A brief overview of findings from studies on learning graphic symbol vocabularies (i.e., learning the association between a graphic symbol and a referent/spoken word) and

findings from studies on bilingual vocabulary learning will be reviewed to frame this study.

1.5 Learning graphic symbol vocabularies

Graphic symbol systems usually consist of a finite set of line drawings, attempting to represent each word in a language to allow a more generative system as the person can then create sentences (Smith, 2006). The success of symbol learning is attributed to several factors. One factor is the symbol's iconicity, which is the degree to which a symbol represents its referent (Mizuko, 1987). Symbols with high iconicity are easier for individuals to learn (Luftig & Bersani, 1985; Mizuko, 1987; Stephenson, 2009). Picture Communication Symbols (PCS) that depict nouns, verbs and descriptors are considered to be relatively transparent when compared to other pictographic systems (Mizuko, 1987), meaning that there is a guessable relationship between the symbol and referent. This makes PCS attractive for selection as an AAC symbol system (Smith, 2006).

While many nouns describe concrete objects, places and people and may lend themselves to being represented by transparent symbols, other parts of speech may not be 'picture producers', and the association between the graphic symbol and the words they represent needs to be taught (Von Tetzchner et al., 1996). When compared to nouns and verbs, PCS symbols that represent 'descriptors' (adjectives and adverbs) are considered to be less transparent. However, they may be translucent (Mizuko, 1987). This means that they are typically not guessable at first exposure. However, once the referent is known, a naïve viewer can typically understand the relationship (semantic, conceptual or linguistic) between the symbol and the referent (Schlosser, Blischak, Belfiore, Bartley, & Barnett, 1998). PCS descriptors will therefore often need to be taught, as the person using AAC will not be able to guess the concept they represent.

A variety of teaching methods have been found effective to teach the graphic symbol-referent relationships (including the ability to match graphic symbols and spoken words) for pre-school children with typical development, as well as pre-school children with developmental and language delays. These include observational experiential language intervention (Barton, Sevcik, & Romski, 2006), paired-associate learning and symbol explanations (Schlosser & Lloyd, 1997), as well as augmented input (e.g., aided language stimulation [Goossens, 1989; Harris &

Reichle, 2004] and aided language stimulations [Romski & Sevcik, 1996]). Overall, these teaching methods can be placed on a continuum, from more direct teaching methods (e.g., paired associate learning) to more indirect, naturalistic approaches (e.g., aided language stimulation). Although all methods have been shown to have a measure of success, research evidence suggests that more direct teaching methods may be more successful, especially for translucent symbols (Emms & Gardner, 2010). Particularly, these symbols may lend themselves to a strategy whereby the relationship between the symbol and the referent is explained (Mollica, 2003). The question now arises as to how children may be taught to associate words from different languages with graphic symbols.

1.6 Learning vocabulary in two languages

A significant amount of research has been done on how children map words from two different languages when they are bilingual (Comesaña, Perea, Piñeiro, & Fraga, 2009; Kroll & Stewart, 1994), which can be used to provide some insight into how persons in need of AAC learn new vocabulary, as well as how the new vocabulary is mapped. Perozzi and Sanchez (1992) found that children who received instruction in their L1 and L2 learnt prepositions and pronouns in L2 faster than those who only received instruction in L2. They proposed that the reason for this was that a link is formed between the two words in L1 and L2, as well as between the concept and the words. Therefore, the child could access the L2 word either via the L1 word or the concept. The children were also able to translate between the two languages (see Figure 3). A link between newly taught vocabulary items in L2 and the conceptual system, that is where information about the concept is stored, has been shown after only one learning session in children between 10 and 11 years of age (Comesaña et al., 2009). It may follow that children need to be overtly taught the association between a graphic symbol and a word in both L1 and L2. Alternatively, they may be able to learn a graphic symbol-word association in only one language (e.g., L2) and be able to ‘translate’ this association to the word in the other language (e.g., L1).

The question now arises as to how children, once they have formed an association between a concept and the word in both L1 and L2, learn to map these words onto a graphic symbol that is not transparent (guessable).

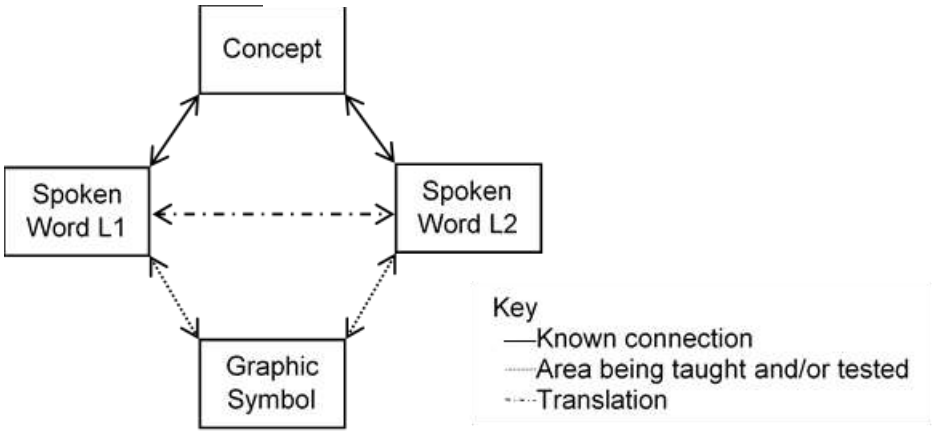


Figure 3. *Proposed link between L1 and L2 word, concept and graphic symbol.*

2. METHODOLOGY

2.1 Aims

2.1.1 Main aim

The main aim of the study is to determine the effect of dual versus mono medium teaching on the ability of Afrikaans-English bilingual typically developing children aged between 4;6 (years;months) and 6;11, to label eight PCS in Afrikaans and English.

2.1.2 Sub-aims

The sub-aims of the study are:

i. To determine the effect of dual medium teaching on children's ability to label graphic symbols in English.
ii. To determine the effect of dual medium teaching on children's ability to label graphic symbols in Afrikaans.
iii. To determine the effect of mono medium teaching in English on children's ability to label graphic symbols in English.
iv. To determine the effect of mono medium teaching in English on children's ability to label graphic symbols in Afrikaans.
v. To compare the effects of mono versus dual medium teaching on children's ability to label symbols in English.
vi. To compare the effects of mono versus dual medium teaching on children's ability to label symbols in Afrikaans.

2.2 Research design and phases

This research was carried out using a randomised within group crossover design (McMillan & Schumacher, 2014). Each child received both Treatment 1 (T_1), namely mono medium teaching of the association between the selected graphic symbols and the words in English, and Treatment 2 (T_2), namely dual medium teaching of the associations between the graphic symbol and the words in both Afrikaans and English, with the order being counterbalanced across participants. The treatment was carried out using either Set 1 (S_1) or Set 2 (S_2) of material being taught. The assignment of set to treatment was also counterbalanced. The

combinations of treatment order and sets assigned to treatment resulted in four different set-order combinations (see Figure 4). During the pre-test, the participants' ability to label the graphic symbols in both Afrikaans and English was assessed, as a measure of their ability to associate each of the symbols with the appropriate word in Afrikaans and the appropriate word in English. After intervention, the post-test (identical to the pre-test) was administered (see Figure 4 for design notation). Before the experiment commenced, all participants were screened to ensure that their receptive vocabulary skills in both Afrikaans and English were age appropriate. Children were then randomly assigned to the treatment order.

Figure 4. *Design notation.*

2.3 Pilot study

A pilot study was conducted to ensure that the procedures and materials proposed for the main study were appropriate.

2.3.1 Participants

One participant was recruited using the procedures described in section 2.4. The participant was a girl aged four years, eight months with Afrikaans spoken 95% of the time at home, and English spoken the remaining 5%. She attended an English-medium pre-school five days a week. Furthermore, this participant complied with all the selection criteria given in Table 3.

2.3.2 Aims, materials, procedures, results and recommendations

The following table gives an overview of the aims of the pilot study, the materials and procedures used, the results and the subsequent recommendations.

Table 2

Pilot Study Aims, Materials, Results and Recommendations

	Aim	Materials	Procedures	Results	Recommendations
Recruitment	To determine if the recruitment strategy was effective.	Parent information letters and consent forms.	The researcher went through the class list with the teacher to identify potential participants whom the teacher thought would meet the selection criteria in terms of language ability and age. An information letter was sent home to the caregivers of the selected children. The teacher was asked to follow up with parents if they had not responded to the consent form.	One appropriate child was identified.	The same procedure should be followed in the main study.
	To determine if the parent questionnaire gathered sufficient information to select and describe potential participants.	Parent biographical questionnaire.	Parents were provided with the questionnaire together with the information letter. The parent who consented also completed the questionnaire and returned it via the teacher.	Sufficient information was gathered.	Keep original format.
	To determine if the teacher questionnaire gathered sufficient information to select and describe participants.	Teacher questionnaire.	The teacher completed the questionnaire.	Sufficient information was gathered.	Keep original format.
Screening and selection	To determine the feasibility of the assent process.	Assent form.	Upon meeting the child in class, the researcher asked assent as per the script, and the child placed a sticker to indicate whether she was willing to participate in the study. Verbal assent was also obtained at the beginning of each subsequent session.	Long process that may have caused anxiety about the process before the child got to the room for screening.	Ask verbal assent when collecting child from class. Use the formal assent form to describe the process in more detail and cover more questions once in room and child seated at table.

	Aim	Materials	Procedures	Results	Recommendations
	To determine if the two vocabulary tests could be administered in one session.	ARW (Buitendag, 1994), PPVT 4 (Dunn & Dunn, 2007) and timer.	The tests were carried out as per protocol, timing how long each test took.	The child was able to do both. A break between the two was not necessary. Discussing the change in language was sufficient.	Do both vocabulary tests one after the other.
	To ensure that 8 selected PCS were not guessable.	Pre-test: 8 PCS symbols, pre-test – post-test script and record form.	The child was asked to label pictures in Afrikaans and English.	The child did not guess any pictures.	The same 8 selected PCS should be used in the main study.
	To determine if the selection criteria were appropriate.	Parent and teacher questionnaire, sentence completion task, ARWT (Buitendag, 1994), PPVT-4 (Dunn & Dunn, 2007), pre-test, post-test.	Compliance with selection criteria was determined from the parent and teacher questionnaires, as well as the results from the ARWT, PPVT-4, sentence completion task and pre-test. The post-test showed whether teaching was effective.	The child could not correctly give the target vocabulary for each concept in the sentence completion task. When the teacher was asked if the child knew those concepts, it was confirmed. The child complied with all the other selection criteria. The post-test indicated that the child learnt all the symbols in both teaching conditions, and spontaneously translated the four symbols taught in the mono medium teaching (English) into Afrikaans. The fact that she did not respond correctly to all items on the sentence completion task therefore did not seem to predict her performance during intervention.	The same procedure should be used in the main study; however, the sentence completion task should be used as additional informal information regarding the child's language abilities and not as a requisite for participation.
	To determine if the teaching strategy was effective.	8 PCS cards and intervention scripts.	The teaching sessions were carried out as per the script.	All symbols taught were retained.	The same procedure should be used for the main study.
Experimental Task	To determine the number of sessions needed for a child to learn to accurately label PCS.	8 PCS cards.	A continuous assessment element was added to the second and subsequent intervention session. Before teaching a symbol (see	The child knew some symbols at the beginning of the second day of teaching but not all. The	Two teaching sessions were deemed appropriate to learn four symbols.

Aim	Materials	Procedures	Results	Recommendations
		intervention script) the researcher first asked the participant to label the symbol.	child knew all the symbols after two teaching sessions.	
To determine if the record form for the pre- and post-test was effective.	Pre-test – post-test record form, and 8 PCS cards.	The form was used to score the results of the pre- and post-tests.	The form did not have place to record the responses of the child labelling the PCS in Afrikaans and English, nor did it have space for more than one pre- or post-test.	Change form to include additional detail.
To determine whether the video recorder position allowed for effective capturing of procedures to rate procedural integrity of pre-test, post-test and intervention.	Video recorder, computer to play back the recording.	The video recorder captured the researcher's actions during the sessions. Recordings were transferred to a computer and viewed.	The video could be viewed with sufficient clarity for the researcher and participant's speech to be used to rate procedural integrity.	No change required.
To determine whether the video recorder position allowed for effective capturing of participant responses during pre- and post-test in order for an independent observer to score the responses.	Video recorder, computer to play back the recording, pre-test – post-test record forms.	The video recorder was set up to capture the participant's responses during the session, without her face being visible. Recordings were transferred to a computer and an independent viewer could record the participant's responses based on video recordings.	The video allowed for capturing of participant's response.	No change required.
To determine how well the researcher adhered to proposed procedures and determine whether any aspects of the procedure needed to change.	Pre-test, post-test and intervention script, procedural integrity forms and video recorder.	The researcher scored adherence to procedures using the procedural integrity rating form. Percentage adherence was calculated.	Percentage adherence was 99%. It was clear that the researcher adhered to the proposed procedures.	Apart from the changes noted in this table, no further procedural changes were required.

2.4 Participants

Non-probability convenience sampling (McMillan & Schumacher, 2014) was used to select four participants from one English private pre-school in Pretoria, Gauteng. The pre-school was situated in a middle-income area. Permission was obtained from the school principal (see Appendix A) to recruit participants from the pre-schools. Teachers were asked to identify children who they estimated as likely to comply with the selection criteria, and to send an information letter and consent form to the relevant parents/guardians (see Appendix B), which requested their consent for their child to participate. Parents/guardians granting written consent were also requested to complete a biographical questionnaire (Appendix C) providing background information, to ensure that the child met certain selection criteria. Based on the selection criteria screened via the parent biographical questionnaire, children who were deemed eligible were then asked to give assent to participate before the assessments commenced. A script with pictures was used to explain the study in child-friendly language, and children were granted the opportunity to indicate whether they assented by placing a sticker for 'yes' or 'no' on a sheet of paper at the start of the first contact session with the researcher (see Appendix D). For subsequent contact sessions, the child was asked verbally for assent.

The participant selection criteria are presented in Table 3 below.

Table 3

Participant Selection Criteria

Criterion	Justification	Measure used
Bilingual, speaking Afrikaans and English.	The study investigated the effect of two teaching strategies on the ability of bilingual children to label symbols in L1 and L2. It was decided to target English and Afrikaans, as these are the languages in which the researcher is proficient. This would allow her to conduct all pre- and post-testing, as well as teaching, and therefore minimise examiner variables. For the sake of convenience and consistency, children from homes where both Afrikaans and English were spoken and who attended	Parent report in the biographical questionnaire (see Appendix C).

Criterion	Justification	Measure used
	English-medium schools were recruited for participation in the study.	
Age appropriate attention span.	The child needed to be able to attend for 15 minutes, to be able to attend throughout the whole teaching session, and during pre- and post-testing.	Teacher report via biographical questionnaire (see Appendix E).
Aged 4,6 – 6;11 with age-appropriate receptive language skills in both Afrikaans and English.	At this age, children typically have well-established language and metalinguistic skills (Edwards & Kirkpatrick, 1999). Both these skills underlie the acquisition of graphic symbol-word associations (Sevcik, 2006). These skills also underlie the ability to translate between languages, and therefore it was reasonable to assume that children may start 'translating' symbol labels learnt in one language to another language.	Age: Parent report in the biographical questionnaire (see Appendix C). Receptive language: Afrikaanse reseptiewe woordeskattoets (ARW, Buitendag, 1994) and Peabody Picture Vocabulary Test – Fourth Edition (PPVT 4, Dunn & Dunn, 2007).
Functional vision and hearing.	Participants needed to be able to perceive the symbols visually, as well as hear auditory instructions.	Teacher report via biographical questionnaire (see Appendix E).
Age-appropriate visual processing skills.	Participant needed to be able to process visual information in the graphic symbol to remember it.	Teacher report via biographical questionnaire (see Appendix E).
Unable to label symbols in Afrikaans or English before treatment.	The intervention was aimed at teaching participants to label symbols in Afrikaans and English, so they should not already be able to do so.	Pre-test.

Eighteen parents/guardians gave consent for their children to participate in the study. Of these 18, only five fully complied with the selection criteria and completed the teaching. One of those five participated in the pilot study. Of the remaining children screened, ten scored below the age-appropriate range in one or more of the vocabulary tests, two guessed more than one PCS in the pre-test and one went away on an unplanned vacation during the teaching period.

Additional characteristics of the participants, such as age, gender, language exposure at home (amount of exposure to Afrikaans and English), and standard scores in the vocabulary tests are described in the table below.

Table 4

Description of Participants

Participant	Age	Gender	Language exposure in the home			Vocabulary scores		Sentence completion task scores	
			Afr	Eng	Other	ARWT	PPVT-4	Afr	Eng
A	5:11	F	70	30		104	96	9	8
B	6:1	M	50	40	10	86	88	8	8
C	5:7	M	40	60		87	96	5	5
D	4:8	M	50	50		85	88	2	5

2.5 Materials and equipment

2.5.1 Materials for screening and for obtaining descriptive background information

A biographical questionnaire was sent to parents with the consent form (see Appendix C). If they consented for their child to take part in the study, they were asked to complete it. A questionnaire was also sent to the teacher (see Appendix E). The questionnaires aimed to gather information about the child's age, language use, vision and hearing skills as well, as their attention span. The parent questionnaire additionally contained questions about language use at home. Receptive language skills in Afrikaans and English were assessed using the Afrikaanse reseptiewe woordeskattoets (Buitendag, 1994) and the Peabody Picture Vocabulary Test – Fourth Edition (PPVT 4, Dunn & Dunn, 2007) respectively.

The ability to express the target concepts in Afrikaans and English was evaluated using a sentence completion task (see Appendix F). The task consisted of a series of pictures shown to the child, consisting of opposite pairs. The first picture was described to the child (for example, *This glass is full*) and an incomplete sentence (with the target word missing) was then given to the child while pointing to the second picture (for example, *This glass is not full, it is…*). Four concepts additional to the concepts represented by the PCS symbols were included in this to avoid priming. The face validity of the task was established by expert feedback. A panel of Afrikaans and English speech therapists currently working with this age group was asked to determine if they feel that five to six-year olds were able to

comprehend and use these concepts. They felt that all the target concepts would be used by children of this age. Some of the additional concepts added to avoid priming were suggested as being unfamiliar to some children of this age. However, this was not considered to be a concern, as the task was not assessing the child's performance with those concepts. The task was then tested on two English-speaking children and one Afrikaans-speaking child. The children were familiar with the concepts and were able to identify the target word from the pictures and their descriptions.

2.5.2 Materials and equipment used during the experimental phase

2.5.2.1 PCS symbols

Eight PCS symbols (see Table 5) were used during the pre-test, the intervention and the post-test. These symbols represent eight descriptors (adjectives). An additional PSC symbol was selected in case the child guessed one symbol during the pre-test, as transparency is subjective. This additional symbol was then substituted in the intervention for the symbol that had been guessed. The symbols and their corresponding labels in Afrikaans and English were chosen with the following criteria in mind:

- Symbols should not be transparent (guessable), as this would make teaching of symbol-word associations superfluous. At the same time, a logical explanation of the link between the symbol and the referent (translucency) should exist to facilitate teaching (Mizuko, 1987). An expert panel, consisting of seven professionals working and/or studying in the field of AAC, evaluated the iconicity of the chosen symbols using the four-point Likert scale developed by Alant, Zheng, Harty and Lloyd (2013). Each PCS symbol and its meanings in Afrikaans and English were provided, and the question was posed "*How similar is the picture symbol to the concept it represents*?" The scale points were defined as 1 = *not at all alike*; 2 = *a little alike*; 3 = *a lot alike*; and 4 = *exactly alike*. The average scores ranged from 1.8 to 3. Although perceived translucency remains in the eye of the beholder, this rating gave a basic indication that, overall, experts considered the symbols to be translucent, that is neither opaque (rating of 1, indicating no similarity) nor transparent (rating of 4, indicating exact resemblance). The selected symbols were then shown to

two English-speaking children to ensure that they were not transparent (i.e., guessable without teaching). The symbols guessed by the children were replaced.

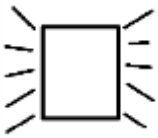
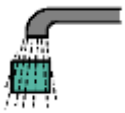
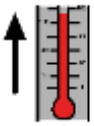
- The concepts (words) represented by the symbols should generally be known to children aged 4;6 to 6;11. The concepts were therefore verified by the same expert panel described above. The concepts selected for the study were deemed to be understood by Afrikaans and English children within this age range.
- The words that the symbol represents should be direct translations of each other to ensure that there is only one word from each language that can be mapped onto a concept.
- The Afrikaans and English words represented by the symbols should not be cross-linguistic cognates of each other, that is they should not originate from the same root word or share phonological surface features, such as the words '*lank*' and '*long*'. This could result in different degrees of cross-linguistic transfer for each of the words, for example, the child might be able to label a specific PCS symbol as representing '*lank*' if they have been taught to associate it with the word '*long*', since '*lank*' and '*long*' share phonological similarities.

Each symbol was printed in colour on white card (5cm by 5cm) and laminated.

Table 5

Target Symbols and Spoken Word Equivalents in Afrikaans and English

PCS	Concept in Afrikaans	Concept in English
	Mooi	Pretty
	Stadig	Slow

PCS	Concept in Afrikaans	Concept in English
	Skoon	Clean
	Leeg	Empty
	Groot	Big
	Nat	Wet
	Swaar	Heavy
	Warm	Hot
	Reguit	Straight

The symbols were randomly allocated to one of two sets. Set 1 consisted of the symbols *PRETTY, CLEAN, HEAVY* and *BIG*. Set 2 consisted of the symbols *SLOW, EMPTY, WET* and *HOT*. The symbol representing *STRAIGHT* substituted the symbol *WET* for Participant A, as she guessed the symbol *WET* during the first pre-test. The symbol *STRAIGHT* substituted the symbol *SLOW* for Participant C, as he guessed the symbol *SLOW* during the second pre-test.

2.5.2.2 Other material

A symbol labelling checklist was used in the pre- and post-test (see Appendix G) to record which symbols the participants were able to correctly identify, as well as to record what their responses were. Treatment sessions for both teaching mediums and symbols sets were scripted to ensure procedural integrity (see examples of procedural checklists for treatment in Appendix H). Procedural checklists for the pre- and post-test were also developed (see Appendix I).

An iPad® was used to video-record all procedures during pre-testing, intervention and post-testing. The participant was offered a sweet and/or a sticker at the end of each session as a reinforcer.

2.6 Procedures

2.6.1 General procedures

Approval for the study was received from the Ethics Board of the Faculty of Humanities at the University of Pretoria (see Appendix J). Permission was received from the principal of the pre-school to recruit participants from the pre-school. Consent from the parents/guardians, as well as assent from the participants, was obtained, as previously described.

The screening, pre-test, treatment and post-test took place in a room removed from the classrooms and playgrounds at the school. All interactions took place in the school morning at a time pre-arranged with the teacher. The child and the researcher were seated at right angles at a child-sized table. Relevant material was displayed on the table. All sessions were scripted and video recorded to allow for interrater reliability (see below).

All interactions with the participants followed similar procedures. The participant was collected from their class by the researcher, on a day selected by the teacher. The researcher explained the study and requested assent, as described in Appendix D. At the beginning of subsequent sessions, the researcher verbally asked for the participant's assent. Once a participant assented, the researcher escorted the participant to the room. Once in the room, the video recorder was switched to record and both researcher and participant sat at the table. The script was followed for the relevant test (pre-test or post-test) or treatment, with verbal reinforcements for the participant's attempts. At the end of the session, the video recorder was stopped and

the participant was offered a sticker and/or sweet as a reinforcer. The researcher then took the participant back to class.

2.6.2 Screening

Screening and assessment of the participants was conducted in the first session. The child completed the receptive vocabulary tests in both Afrikaans and English, according to the procedures stipulated by these tests.

The sentence completion task was administered by following the script given in Appendix F. The task included a short verbal instruction and then the administration of the items, each supported by a picture. When a child did not answer within five seconds, the item was repeated once. When an incorrect answer was given, the researcher gave corrective feedback ("No, that is not the word I am looking for.") and provided a second opportunity ("Let's try again."). A second non-response or incorrect answer would result in moving on to the following question. Intermittent non-specific positive feedback (for example, "You are working hard.") was used to encourage the child to continue the task.

Information from the parent questionnaire, as well as the results of the Afrikaans and English vocabulary tests and sentence completion task, were used to determine if the child complied with the selection criteria.

2.6.3 Experimental phase

The experimental phase of the study consisted of both testing (Pre-test 1 and 2, Post-test 1 and 2, and additional testing) and treatment. The exact procedures during each day are explained in Table 6.

Table 6

Daily Procedures Executed During the Experimental Phase of the Study

Day	Procedures executed
1	• Pre-test 1 (testing of four symbols targeted during 1st treatment in Afrikaans and English) • Additional testing of the other four symbols assigned to the 2nd treatment condition in Afrikaans and English (this was done to ensure

Day	Procedures executed
	that participants could not label any of the symbols to be used in the study). • 1st treatment: Session 1
2	• 1st treatment: Session 2
3	• Post-test 1 (testing of four symbols targeted during 1st treatment in Afrikaans and English). • Pre-test 2 (testing of four symbols targeted during 2nd treatment in Afrikaans and English). • 2nd treatment: Session 1
4	• 2nd treatment: Session 2
5	• Post-test 2 (testing of four symbols targeted during 2nd treatment in Afrikaans and English).

2.6.3.1 Testing

During testing, a performance measure was used to record how many symbols the participant was able to correctly label in Afrikaans and English. Testing was completed in one language before commencing in the other language. The researcher introduced a testing session by using and pertinently referring to the language in which the child was expected to provide labels. For example, she said, “I will now show you some pictures. I want you to tell me what these pictures mean using English words.” The participant was shown one symbol at a time. Each time the researcher asked, “What does this picture mean?”, followed by an expectant pause of up to five seconds. A response was acknowledged in a neutral way. If the child responded in the alternate language, they were reminded to speak in the other language and were given one more opportunity to respond. No corrective feedback was given. If the child did not answer within five seconds, the researcher moved to the next item. All nine PCS symbols were tested on Day 1 to ensure that the participant did not guess any of the symbols. One participant guessed one symbol correctly on Day 1 in Afrikaans and English (*stadig/slow*), and therefore this symbol was replaced with the symbol for *straight*. During Day 3, one participant correctly guessed one symbol in Afrikaans and English (*nat/wet*) allocated to the second

treatment, although he had not guessed it correctly during Day 1. Therefore, this symbol was replaced with the symbol for *straight*.

2.6.3.2 Treatment

Treatment procedures consisted of explanations of symbol-word associations, mands, models and corrective feedback. During each session, lasting ten minutes, symbols were presented one at a time. The researcher gave the meaning of the symbol and explained the association between the symbol and the concept it represented. For example, she said, “This picture means ‘slow’. The picture shows a tortoise. A tortoise is not fast, it is very slow. That’s why the picture means ‘slow’.” The symbol explanations in Afrikaans and English are provided in Appendix K. The researcher then provided a mand for the label of the symbol (“So tell me, what does this picture mean?”), provided corrective feedback, a model and another mand in the case of a wrong answer (“No, this picture does not mean…, it means ‘slow’. Can you tell me again what it means?”), until such time as the correct label was received, with a maximum repetition of three times. She then moved on to the next symbol. During a session, symbols were presented in random order. During mono medium instruction, each symbol was taught twice – after all four symbols had been taught once, they were taught again in the same order. During dual medium teaching, each symbol was taught once in Afrikaans and once in English, with both languages being used consecutively for the same symbol before moving on to the next symbol. The order (Afrikaans first versus English first) was counterbalanced across participants as well as across the two sessions. For example, Participant A was taught each symbol in English and then Afrikaans when receiving dual medium teaching in session one, which changed to Afrikaans before English for each symbol in session two. The researcher purposefully used both English and Afrikaans interchangeably in her introduction of the session, in line with a ‘translanguaging’ approach (Creese & Blackledge, 2010). The procedural integrity checklists included in Appendix H contain examples of the scripts used in both the mono medium and dual medium conditions.

2.6.4 Data analysis

Descriptive statistics (McMillan & Schumacher, 2014) were used to describe the accuracy with which participants were able to label symbols in Afrikaans and English pre- and post-treatment in both teaching mediums. The central tendency

(mean number correct) as well as the variation (standard deviation and range) were calculated per group pre- and post-treatment. Graphs are used to display the difference pre- and post-treatment, as well as the difference between the two treatment methods post-treatment.

2.6.5 Reliability and validity

The face validity of the selection of the eight PCS symbols, as well as the sentence completion task, were evaluated by expert panel feedback. A pilot study was done to ensure that measures used for screening and procedures used for pre- and post-testing as well as for intervention were appropriate.

Possible order effects during intervention were addressed by counterbalancing the order of presentation of Afrikaans and English teaching across participants. Sets of target items were also counterbalanced across treatment conditions to monitor any effect of the set on learning.

Threats to internal validity of experimental research typically include history, maturation and diffusion of treatment (McMillan & Schumacher, 2014). As young children were used, with no exposure to PCS previously, they were not influenced by any history of symbol exposure. Intervention and post-test took place over no longer than a week, reducing the risk of maturation. The screening and first pre-test took place the week prior to this. The post-test was carried out on the day following the conclusion of intervention, reducing the risk of diffusion of treatment.

The researcher conducted all tests and treatments to reduce variation. Procedural reliability of pre- and post-test and intervention sessions were evaluated by an independent observer, who watched the video recordings of pre-test, post-test and intervention sessions (25% randomly selected across both treatment groups) and rated adherence to the procedural script. Percentage adherence was calculated using the following formula:

$$\frac{\text{Number of steps correctly executed}}{\text{Total number of steps}} \text{ X } 100$$

Overall mean percentage of adherence to the pre- and post-test script was 99% (range 97% - 100%). Overall mean percentage of adherence to the treatment procedures was 98% (range 95% - 100%).

Reliability of results was determined by having an independent observer (blind to the type of treatment received by the participant) score the participant's ability to label the symbols in Afrikaans and English from 30% of pre-test and post-test video recordings. Recordings were randomly selected with equal representation of pre-test and post-test sessions across both treatment groups. The reliability of the data was calculated by the following formula:

$$\frac{\text{Number of agreements}}{\text{Number of agreements plus disagreements}} \text{ X } 100$$

The mean percentage of agreement between the two raters was 100%.

The small sample size precluded the use of inferential statistics. This research is an exploratory pilot study, which should be replicated over a wider demographic, using different languages to Afrikaans and English in the future to obtain more representative results.

2.7 Ethical issues

Ethical principles and guidelines discussed by McMillan and Schumacher (2014) have been used to guide the ethical considerations for this research. Full disclosure as to the purpose of the research, as well as the method, was given by the researcher to the school (see Appendix A), as well as the parents (see Appendix B). In this research, full disclosure did not impact on the validity of the results, as the PCS symbols and the concepts they represent were not provided in this disclosure, and therefore the participants could not have been primed for the intervention. All parents of the children identified by the school to meet the criteria were contacted, and their decision to allow their child to participate was voluntary. This willingness was shown through them providing written informed consent (see Appendix B). Each child was also asked verbally to give their assent when the researcher initially collected them from class, and to respond by placing a sticker on a form when they reached the treatment room. Moreover, the treatment was explained to them using a visual script (see Appendix D). No harm or risk to participants was anticipated in this research. Children were not asked to answer any personal questions, and during pre- and post-test they received the same response from the researcher whether they answered correctly or incorrectly, therefore not having a negative emotional impact if

their performance was low. As data was analysed using descriptive statistics of summative performance measure, even though there is a limited sample size there is limited chance that specific participants' results will be able to be identified. Confidentiality was maintained through the use of letters to identify participants. Biographical questionnaires and score sheets are kept in a secure location at the Centre for Alternative and Augmentative Communication for storage for 15 years post completion of the research.

3. RESULTS AND DISCUSSION

This section will present the results of the study and discuss them in light of previous literature. Before the results pertaining to the main aim and sub-aims are discussed, the data are examined for possible effects of treatment order and set on the results. Due to the limited number of participants, only descriptive data are presented.

3.1 Possible effects of treatment order

The order in which the two teaching methods were administered was counterbalanced across participants, with two of the participants receiving mono medium teaching first and two receiving dual medium teaching first. Since both teaching methods involved teaching of four English symbol labels, results of English symbol labelling obtained during Post-test 1 were compared to English symbol labelling results obtained during Post-test 2. Figure 5 displays the results obtained during the Pre-test, Post-test 1 and Post-test 2 for each of the four participants. Two participants clearly performed better in Post-test 2, whereas the other two performed at ceiling levels during both post-tests. It would appear that there was an order effect for two participants, as they seemed to learn the four symbol labels in English more effectively during the second treatment. It is possible that their ability to learn the labels (and associations between symbol and word) improved with additional exposure to the type of teaching given (symbol explanations, models and mands).

However, since the order of presenting sets and teaching methods was counterbalanced across participants, order effects were effectively controlled for in the study.

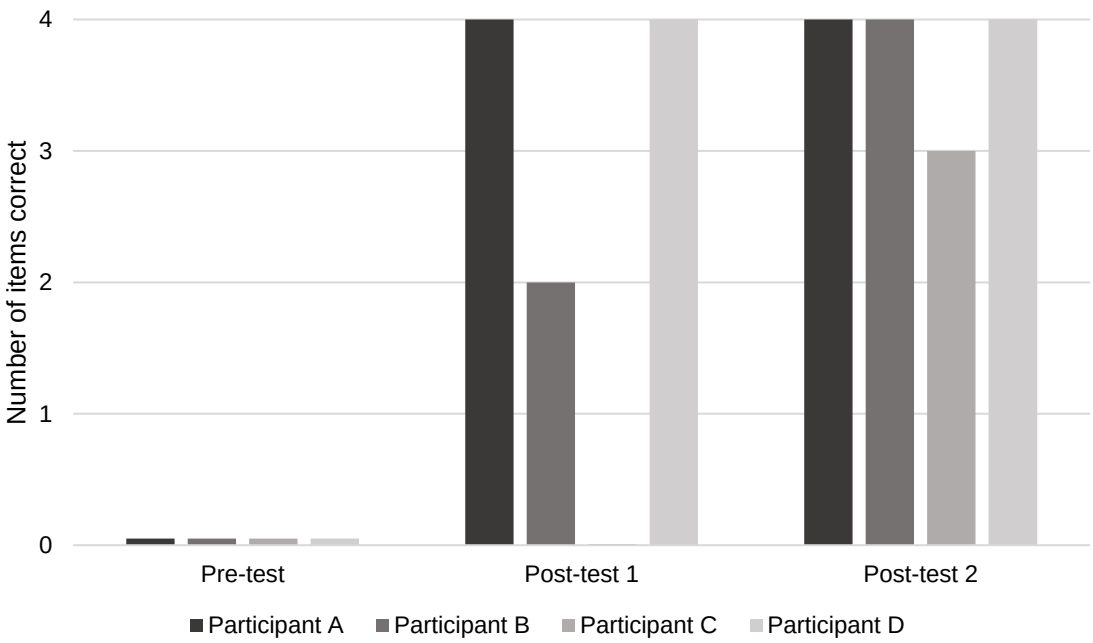


Figure 5. *Results of English PCS labelling per treatment order.*

3.2 Possible effect of sets

The eight PCS symbols were divided into two sets of four. Each child was taught one set using dual medium teaching, and one set using mono medium teaching. The allocation of set to teaching method was counterbalanced across participants. Since both teaching methods involved teaching four English symbol labels, post-test results of English symbol labelling obtained for each set were compared. Figure 6 displays the results for the two sets per participant obtained for the pre- and post-test.

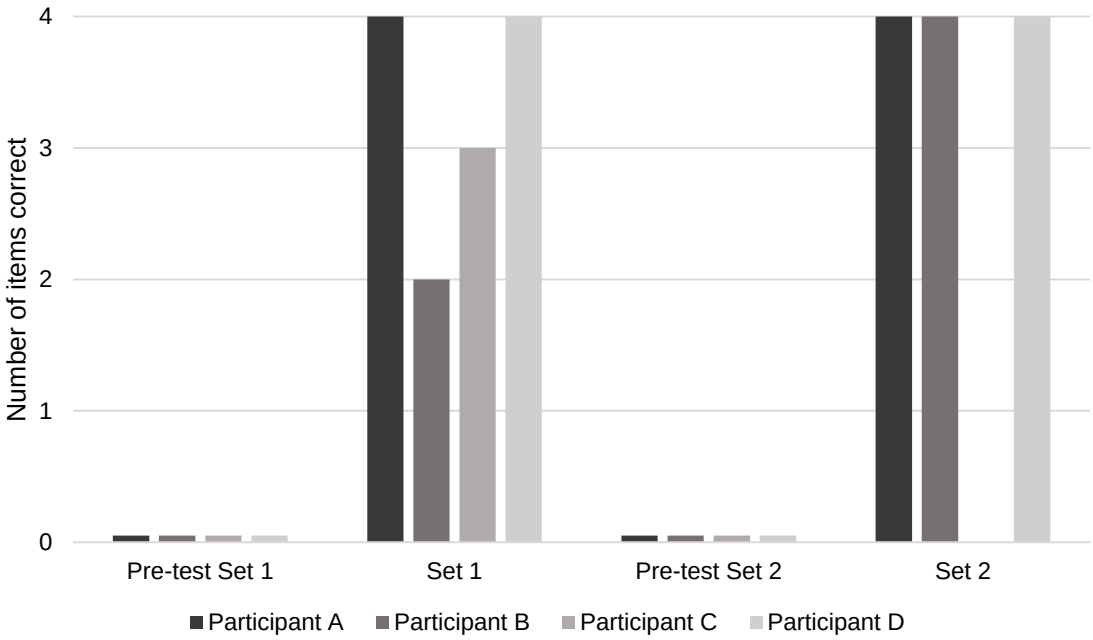


Figure 6. *Results of English labelling of PCS per set.*

Although there was some variation in how participants responded to the two sets, there is no clear indication of one set being easier than the other. Since sets were counterbalanced across teaching methods and participants, any possible effected were also controlled.

3.3 The effect of dual versus mono medium teaching on PCS labelling in Afrikaans and English

The main aim of the study was to determine the effect of dual versus mono medium teaching on the ability of functionally bilingual typically developing children aged between 4;6 (years;months) and 6;11 to label eight PCS in Afrikaans and English. To address the main aim, the results will now be discussed in the order of the sub-aims, which were:

vii. To determine the effect of dual medium teaching on children's ability to label graphic symbols in English.

viii. To determine the effect of dual medium teaching on children's ability to label graphic symbols in Afrikaans.

ix. To determine the effect of mono medium teaching in English on children's ability to label graphic symbols in English.

x. To determine the effect of mono medium teaching in English on children's ability to label graphic symbols in Afrikaans.

xi. To compare the effects of mono versus dual medium teaching on children's ability to label symbols in English.

xii. To compare the effects of mono versus dual medium teaching on children's ability to label symbols in Afrikaans.

3.3.1 The effect of dual medium (Afrikaans and English) teaching on English labelling

Figure 7 shows the performance of each of the four participants during the pre- and post-test when tested in English (L2) on items taught during dual medium teaching.

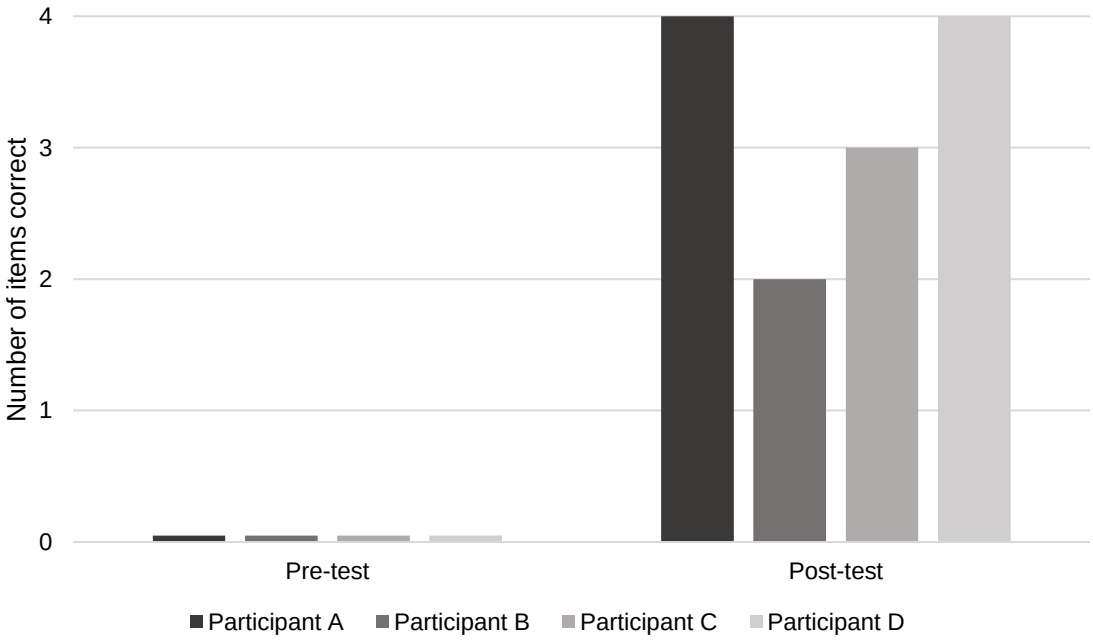


Figure 7. *Results of English labelling of PCS for dual medium teaching.*

From Figure 7 it is clear that none of the symbols were labelled correctly during the pre-test. All four participants were able to correctly label (some of) the symbols in the post-test. This suggests that the teaching method employed was effective for most participants. They were able to learn the English labels of four PCS symbols when they were taught these labels in English and Afrikaans in two sessions. This result was expected as symbol explanations, mands and models have

been found effective to teach the meaning of symbols in previous studies (Mollica, 2003).

Table 7 gives an overview of the three errors made during the post-test.

Table 7

Errors in English labelling during dual medium teaching post-test

Participant	Target label	Response given
Participant B	Pretty	Rainbow and flowers
	Heavy	Bell
Participant C	Big	Very black

From the table it is clear that participants did not provide Afrikaans labels instead of English labels when providing incorrect responses, but rather provided different English concepts. It is clear, therefore, that they did not confuse the target languages.

3.3.2 The effect of dual medium (Afrikaans and English) teaching on Afrikaans labelling

Figure 8 shows the performance of each of the four participants during the pre- and post-test when tested in Afrikaans (L1) on items taught during dual medium teaching.

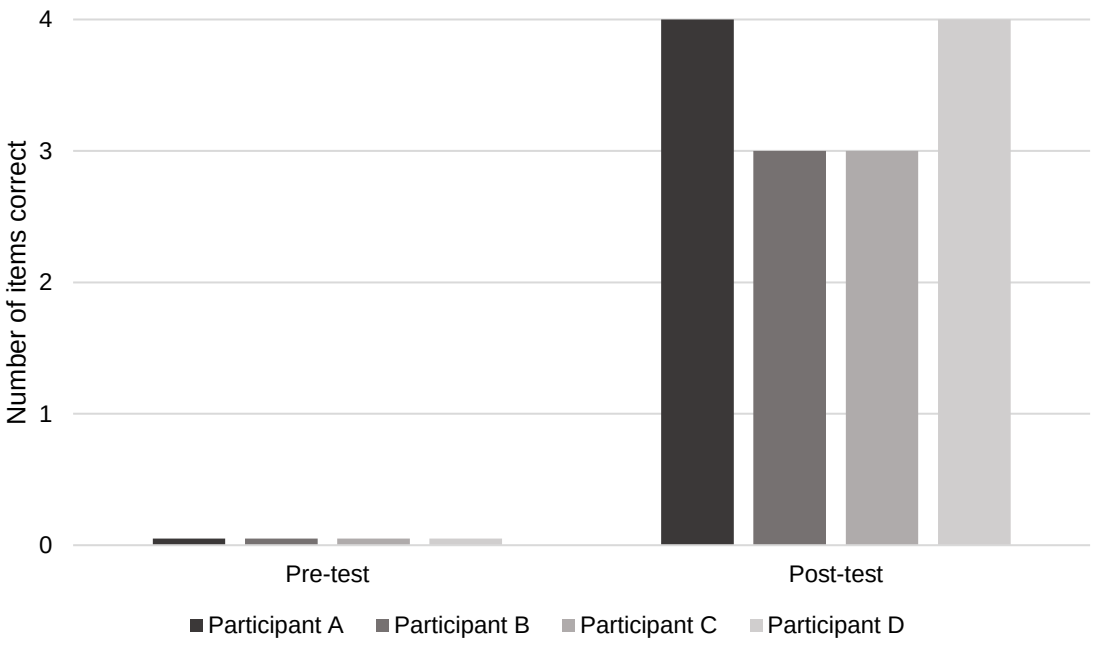


Figure 8. *Results of Afrikaans labelling of PCS for dual medium teaching.*

From Figure 8 it is clear that none of the symbols were labelled correctly during the pre-test. The participants were able to correctly label most of the symbols in the post-test. This suggests, once again, that the teaching method employed was successful for the participants. They were able to learn the Afrikaans labels of four PCS symbols when they were taught these labels in English and Afrikaans in two sessions. As mentioned above, this result was expected, as symbol explanations, mands and models have been found effective to teach the meaning of symbols in previous studies (Mollica, 2003).

Table 8 gives an overview of the two errors made during the post-test. English translations are included in parentheses.

Table 8

Errors in Afrikaans labelling during dual medium teaching post-test

Participant	**Target label**	**Response given**
Participant B	Mooi (‘pretty’)	Reënboog en blommetjies (‘rainbow and flowers’)
Participant C	Groot (‘big’)	Swart (‘black’)

From the table it is clear that the two errors made mirrored the two errors made during English labelling, as the same incorrect concepts that were given in English were provided in Afrikaans. This suggests that the errors made were of a conceptual nature – participants had not made the link between the symbol and the correct concept it represented, but rather, linked the symbol to a different concept which they described in both Afrikaans and English. It has been shown in previous research that children are able to form a direct link between a concept and a previously unfamiliar word in a new language after one session of association learning (Comesaña et al., 2009).

3.3.3 The effect of mono medium English teaching on English labelling

Figure 9 shows the performance during the pre- and post-test for each of the four participants when tested in English on items taught during mono medium teaching.

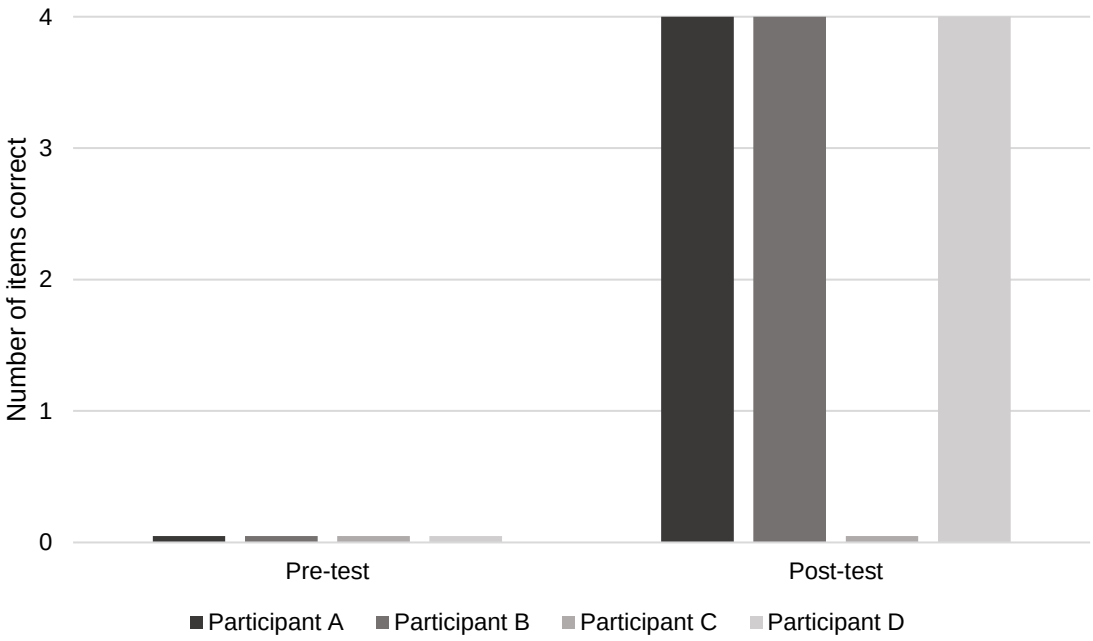


Figure 9*. Results of English labelling of PCS for mono medium teaching.*

From Figure 9, it is clear that none of the symbols were labelled correctly during the pre-test. Three of the four participants were able to correctly label all four of the symbols in the post-test. This again suggests that the teaching method employed was effective for most participants – they were able to learn the English

labels of the four PCS symbols when they were taught these labels in English in two teaching sessions. Participant C did not label any symbol correctly in the post-test. Due to illness, two days elapsed between the last day of teaching and the post-test. In addition, he had not fully recovered on the day of the post-test, which may have contributed to a worse performance. The fact that he performed better on the English PCS labels taught during the dual medium teaching (see results discussed in Section 3.3.1), may suggest that the illness and time elapsed between teaching and testing affected his performance.

3.3.4 The effect of mono medium English teaching on Afrikaans labelling

Figure 10 shows the performance during the pre- and post-test for each of the four participants when tested in Afrikaans on items taught during mono medium teaching.

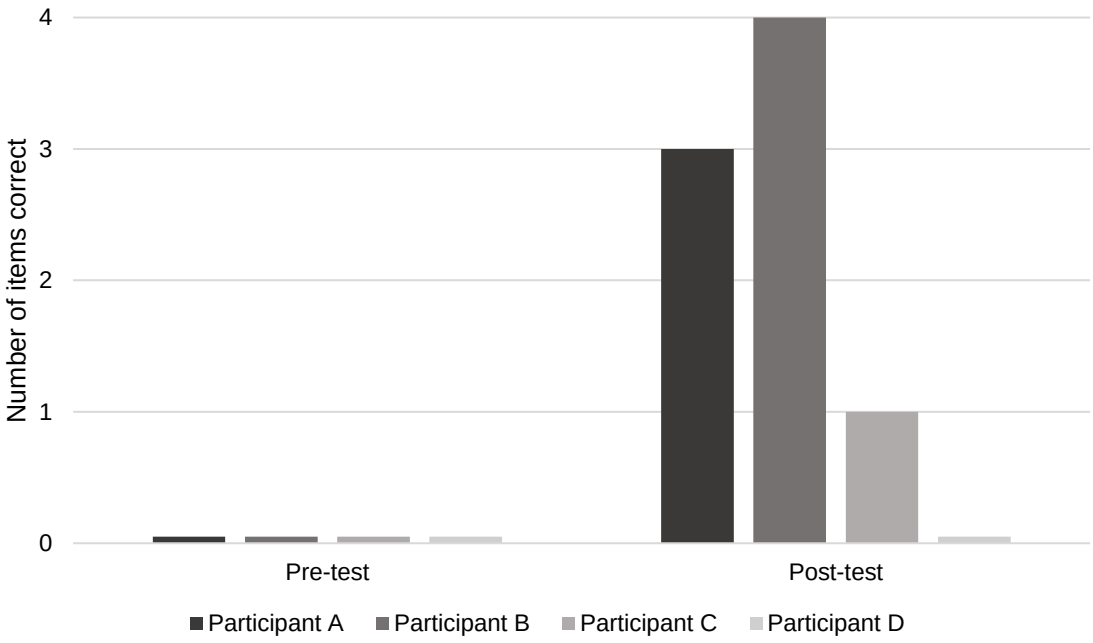


Figure 10. *Results of Afrikaans labelling of PCS for mono medium teaching*.

From Figure 10, it is clear that none of the participants knew any of the symbol labels in Afrikaans before teaching commenced. During the post-test, three participants seemed to be able to spontaneously 'translate' some of the symbol labels taught in English to Afrikaans. For example, if taught that the label for the picture of the tortoise was '*slow*', when asked if they could give an Afrikaans meaning

for the picture, they were able to generate the label '*stadig*' themselves. Participants A and B (who learnt all four symbol labels in English – see Figure 9) were able to translate three and four of these into Afrikaans respectively. Interestingly, Participant C, although he did not respond correctly when asked to provide the English labels in the post-test (see Figure 9), was able to supply one correct label in Afrikaans during the post-test. Participant D, although he learnt all four labels in English, did not translate any to Afrikaans. Instead, he gave the English labels when asked to provide the Afrikaans labels. It is possible that he did not understand what was expected of him. It should be noted that he was the youngest of the four participants and had the lowest standard score for Afrikaans receptive vocabulary.

It is also noteworthy that Participants A and B knew most of the Afrikaans words targeted in the study beforehand, as evidenced by their results on the sentence completion task, where they scored eight and seven out of eight words respectively. Participant C, scored four out of eight, while Participant D scored zero out of eight. This suggests that Participants C and D's expressive skills in Afrikaans may have been lower than those of Participants A and B. Both Participants A and B were reported to have slightly higher exposure to Afrikaans than to English at home, while Participant C had slightly higher exposure to English. Exposure to Afrikaans and English was equal for Participant D. Children are able to naturally translate words from as soon as they begin to learn an additional language (B. Harris & Sherwood, 1978). However, they need to be exposed to the word in both languages before they can do so.

The finding that some participants spontaneously translated symbol labels may be a positive one. When a bilingual graphic symbol-based AAC system is designed in a way that one symbol maps onto words (in two different languages) that are direct translations of each other, it would be helpful if persons using the system could spontaneously translate some of the symbols learnt in one language into the other language. The finding in the current study suggests that the two children with receptive skills in both languages at an age equivalent of about 6;0 (years;months) were able to do so. It must be noted that these children were also able to express most of the concepts targeted in both languages before teaching commenced. In children in need of AAC, expressive vocabulary is difficult to test, since these tests typically require spoken responses. In future studies it would be helpful to ensure that children have an understanding of the words in both languages, since translation can

only occur when words are known in both languages (Comesaña et al., 2009; B. Harris & Sherwood, 1978).

3.3.5 Comparison of the effect of dual versus mono medium (English) teaching on English labelling

Figure 11 shows a comparison of the performance of the four participants for post-test results of English labelling (L2) when exposed to dual versus mono medium teaching.

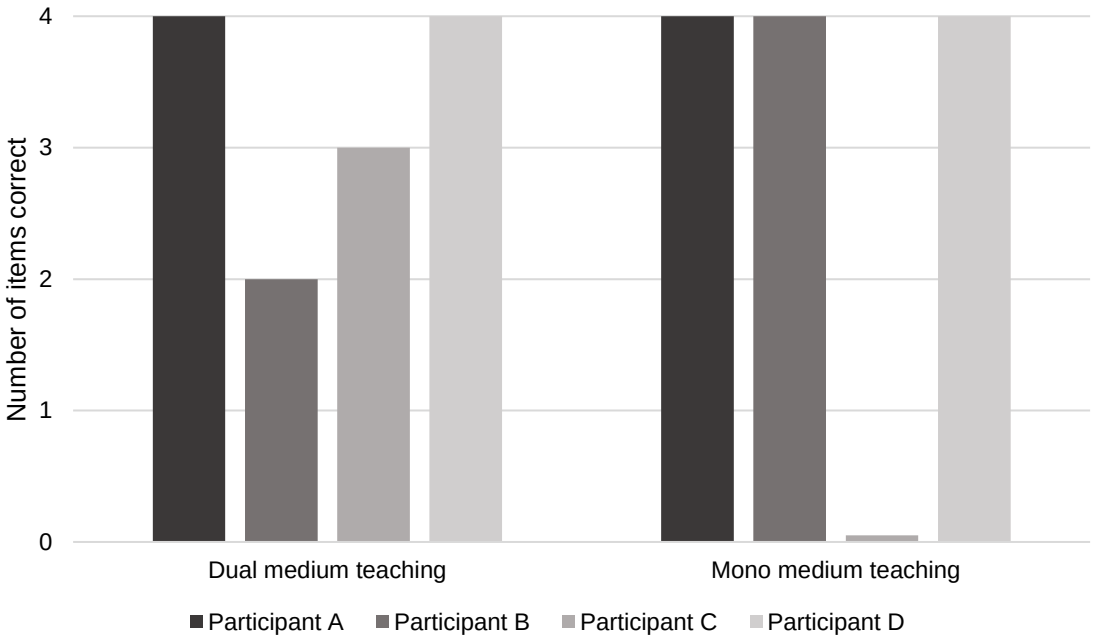


Figure 11. *Results of English labelling of PCS for dual and mono medium teaching.*

Figure 11 shows that the participants' performance in labelling symbols in English was similar during dual and mono medium teaching. Participant B performed better during mono medium teaching. Participant C performed better during dual medium teaching, although this was probably due to illness, as discussed previously. Bilingual children therefore benefit from both dual and mono medium teaching. In dual medium teaching, the English concept was taught once, and the Afrikaans concept was taught once per teaching session. In mono medium teaching, the English concept was taught twice per teaching session. More frequent teaching in English did not seem to advantage learning during mono medium teaching. This may also suggest that conceptual learning took pace regardless of which language was used for teaching.

3.3.6 Comparison of the effect of dual versus mono medium (English) teaching on Afrikaans labelling

Figure 12 shows a comparison of the performance of the four participants for post-test results of Afrikaans labelling when exposed to dual versus mono medium teaching.

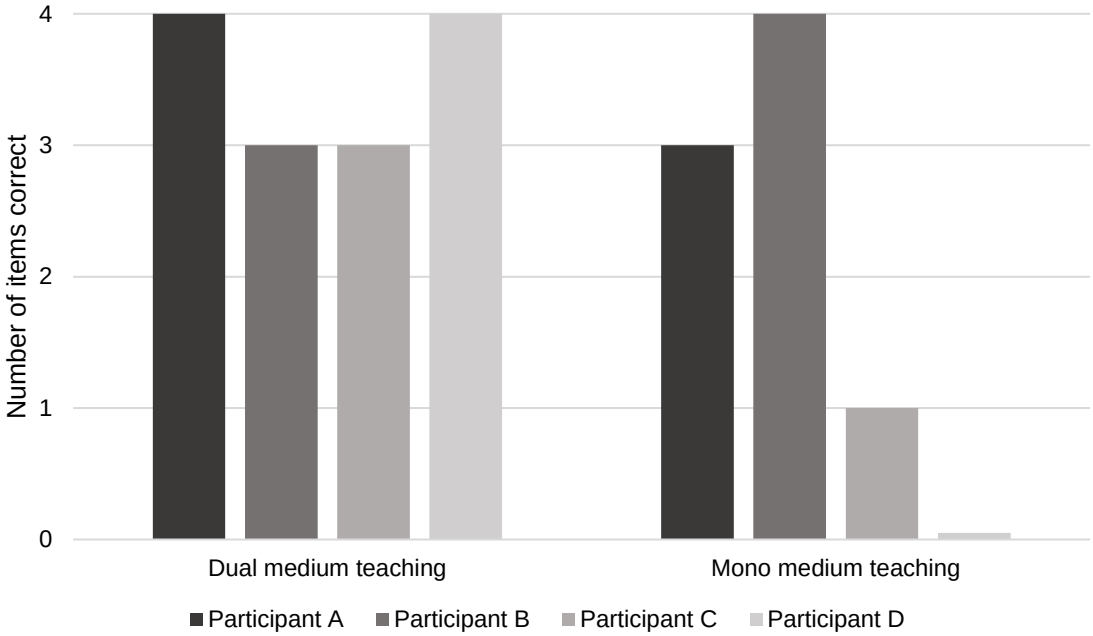


Figure 12. *Results of Afrikaans labelling of PCS for dual and mono medium teaching.*

From Figure 12 it is evident that, although some participants were able to spontaneously translate labels learnt in English into Afrikaans, actual teaching of the Afrikaans labels led to better performance in three of the four participants. As discussed above, it seems that receptive and expressive language skills in both languages influence children's abilities to translate symbol labels learnt in one language into another language, and, although some children may understand two languages, this does not necessarily mean that they are able to translate between languages when called upon to do so (B. Harris & Sherwood, 1978). However, they may still be able to learn labels of symbols in two languages if they receive direct instruction in each language. The extent to which the teaching enables a connection to be formed not only between the PCS symbol and the word, but also between the symbol and the concept, as well as between the words in both languages, remains a matter of speculation. It has been suggested that simultaneously bilingual children

start exercising and building up a co-ordinated bilingual vocabulary from an early age, rather than two autonomous, monolingual vocabularies (Comesaña et al., 2009; B. Harris & Sherwood, 1978). This means that children seem to connect two words (in two languages) to the same concept relatively early in bilingual development. The research by Comesaña et al. (2009) further emphasises the early formation of links between concepts and newly learnt vocabulary items in L2.

4. CONCLUSION

This study aimed to compare the effect of dual versus mono medium teaching on PCS labelling in Afrikaans and English. It was a pilot study with a limited number of participants, as it is a relatively new area of research. The study found that the teaching method of symbol explanations, mands and models was effective to teach typically developing pre-school children to associate words and PCS symbols in two sessions. The children were correctly able to label most of the symbols in English, whether they were taught in mono (L2) or dual medium. The children were also able to label most of the symbols in Afrikaans when they were taught in dual medium (Afrikaans and English). Some of the children were able to translate the label of the symbols that they taught in L2 into L1, that is from English to Afrikaans. This ability appeared to be influenced by their receptive L1 vocabulary score, as well as if they correctly used the concepts expressively in the sentence completion task during the screening.

4.1 Strengths

While only descriptive data is presented in this study due to it being a pilot study, the results do provide valuable information that can be used in future research in this area. The type of teaching method that the child received, that is, mono versus dual medium, as well as the set used for each teaching method, were counterbalanced between participants to reduce any possible treatment order or set effects. The crossover study design allowed for four sets of data for each of the treatment approaches from the four participants, providing more data for comparison than if each participant had received only one treatment approach.

The provision of an additional PCS as an allowance for the participants to guess the meaning of one symbol during the pre-test was valuable as it allowed participants who complied with all the other selection criteria to remain in the study. This is important as the transparency of symbols is subjective, and while the symbols were tested for transparency prior to the study, the chance of a child guessing a symbol could not be ruled out.

4.2 Weaknesses

The limited sample size negatively impacted on the validity of the results in this study. The results must be regarded as extremely tentative, as the date collected

is very limited. The age range of participants is fairly large for such a small sample size, which further complicates any conclusions one may draw from the results. A larger sample, possibly stratified by age, should be included in future studies to more fully explore children's performance in mono and dual medium teaching.

A more robust measure of the ability to express and/or comprehend the words (in both languages) that the PCS symbols represent should be considered as an in/exclusion criterion. To translate between languages, children need to know the words in both languages (B. Harris & Sherwood, 1978).

The limited sample size resulted in the results from Participant C being included, even though time elapsed between the teaching and the post-test of the first set due to illness. This may have affected the results in the post-test. The selection criteria in the current study did not consider this possibility. In a larger sample this data may have been excluded.

The current study did not include the maintenance of the ability to label PCS. In the use of AAC this is an important skill, as the ability to remember the association between word and symbol would enable the person to use the symbol in a conventional way.

4.3 Clinical implications

As this is a pilot study, clinical implications may only tentatively be drawn from the current research, which involved pre-school children with typical development aged 4;6 (years;months) to 6;11, who speak Afrikaans and English. In learning to use a graphic symbol-based AAC system where one symbol maps onto words in two different languages, a useful skill for the person using the AAC system would be the ability to spontaneously translate some symbol labels learnt in one language into the other language. The finding that some of the participants in this study were indeed able to spontaneously translate symbol labels that they were taught by mono medium teaching tentatively suggests that children with age-equivalent receptive language skills of six years or older may not, in all cases, need instruction in the symbol-referent associations in both languages. However, additional research is needed to more fully understand this phenomenon in both typically developing children, and children who require AAC.

4.4 Recommendations for future studies

Future research is recommended to increase the scale of the current research, to include a greater sample size and possibly to have the receptive and expressive knowledge of the concepts in both languages as a prerequisite. Since age and receptive language abilities seemed to influence children's ability to translate symbols, the sample should be carefully selected with these variables in mind. Additionally, it should be expanded to include children who have different L1 and L2 than those included in the current study, in other words an L1 and L2 not Afrikaans and English respectively. This would increase the ability to generalise the results to populations who communicate in different languages.

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Appendix A

School Permission Letter

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Faculty of Humanities

(date)

The Principal:
(School name and address)

Dear _____

Re: Permission to conduct a research study at *(name of school)*

I am currently enrolled for a master's degree in Augmentative and Alternative Communication (AAC) at the University of Pretoria. As part of my degree I am conducting a research project. The title of this study is "*The effect of dual versus mono medium teaching on the ability of functionally bilingual, typically developing children to label graphic symbols in Afrikaans and English*".

I would like to request permission for me to include children from your school in this study.

Rationale for the study
Children who cannot rely on speech to communicate may need other methods to express themselves. These methods may include picture symbols (also called graphic symbols). Typically, these picture symbols represent one specific language (e.g. English). However, an increasing number of people in South Africa who need these systems come from multilingual backgrounds. At present it is not clear if a child is able to learn a picture symbol in one language and then translate this to another language. This study is starting to explore how bilingual children with typical development may learn picture symbols in two languages. This information will help us to understand how children who cannot speak may be able to learn these picture symbols.

What will be expected of the school?
I will require the help of the teachers to identify children in their class who are aged between 5 and 6 years old, and are functionally bilingual in Afrikaans and English. Teachers will then be asked to send information and consent forms to the relevant parents. If parents consent for their child to participate, and the children agree to do so,

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Email saak@up.ac.za
www.caac.up.ac.za

then both the parents and teachers will be asked to fill in a background questionnaire about the child, the child's language skills and general performance in class. Following this, I will arrange with the teacher for a suitable time to take the child for screening, and later for teaching of the different symbols. Half of the children identified as suitable for participating will be taught in English, and the other half will be taught in both Afrikaans and English. The children will then be asked to label the symbols they have been taught in both languages.

What will be expected of the children participating in the study?
Should parents give consent for their child to participate in the study, the following will be expected of him/her:

- The child will meet me with the teacher present. I will then use pictures to explain what the study is about, and ask the child if he/she agrees to participate.
- If the child agrees, I will screen his/her language abilities in Afrikaans and English.
- This screening procedure will take about 30 minutes.
- If the screening procedure is passed, the child will then be taught the meaning of eight picture symbols in daily individual teaching sessions. Four will be taught in English, and the other four in English and Afrikaans. The first session will commence by asking the child to say what they think the meaning of the first four symbols is. Then they will be taught the meaning of the symbols for two sessions. During the third session, they will be asked to say the meaning of the first four symbols again. The same procedure will be followed for the next four symbols. Altogether, 5 sessions are planned on 5 consecutive days. Each session will last about 10 minutes.
- After each session, the child will be given a sticker as a token of appreciation for his/her participation.
- All interactions during the study will be video recorded in order for me to ensure that I execute the procedures correctly. The focus of the camera will be on me and the picture symbols, rather than on the child.

The following ethical principles will be upheld within this study:

- Ethics approval has been applied for from the Ethics Committee of the Faculty of Humanities at the University of Pretoria. Proof will be sent when received.
- Written consent from all participants' parents as well as assent from the children will be obtained prior to conducting the study.
- All the children and parents will be made aware of their right to withdraw from the study at any point in time without any negative consequences to themselves.
- The video recordings and data collected during the study will only be accessed by myself, my supervisor and a research assistant.
- All information will be kept confidential from those external to the study. No individual or school names will be mentioned in any published data.

Who will have access to the results of the study?

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The data will be stored in both hard copy and electronic format at the University of Pretoria in the Centre for Alternative and Augmentative Communication for 15 years. The data obtained from the research will be used for writing a Master's dissertation, writing scientific papers and for presentation at professional conferences and seminars. A summary of the results will be made available for any interested staff or parents. Data may be used for secondary data analysis.

What are the risks and benefits?
At no time during the participation in the research will the children be at risk of any harm. Teachers will be consulted about an appropriate time to remove the child from the class to ensure that they do not lose out on valuable class time.

Potential benefits of this study may include a better understanding about how to use picture symbols to enhance the communication of children from multilingual backgrounds who cannot speak.

I would be grateful if you could indicate whether you do/do not give permission for me to recruit participants through your school by completing the form attached.

Please feel free to contact me or my supervisor if you have any questions about this study. I look forward to your response.

Kind regards,

_____ _____
Amy Wylie Date
Email: XXXXXX
Cell number: XXXXXXXXX

_____ _____
Dr Kerstin Tönsing Date
Centre for Augmentative and Alternative Communication
kerstin.tonsing@up.ac.za
012 420 4729

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Faculty of Humanities

Principal permission: Reply Slip

Name of principal: _____

Name of school: _____

Project title: *The effect of dual versus mono medium teaching on the ability of functionally bilingual, typically developing children to label graphic symbols in Afrikaans and English.*

Researcher: Amy Wylie
Master's candidate
Centre for AAC
Cell:

Supervisor: Dr Kerstin Tönsing
Senior lecturer
Centre for AAC
Tel: 012 420 4729

I, _____.
Name and Surname

(*please tick box that applies*)

☐ give permission to Amy Wylie to recruit learners from the school named above for possible participation in this study. This permission is voluntary and I understand that I may withdraw at any time. I understand that participating children will be video-recorded. I understand that the data will be securely stored for 15 years at the CAAC and that all data will be treated confidentially. I understand that the data may be re-used for analysis. I understand that the data may be used for a scientific article and for conference presentations. I understand that all information used and obtained in this study will be treated as confidential.

OR

☐ do not give permission to Amy Wylie to recruit learners from the preschool named above for the possible participation in this study.

_____
Principal Signature

_____
Date

School stamp

Fakulteit Geesteswetenskappe
Lefapha la Bomotho

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Appendix B

Parent Consent Letter

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Faculty of Humanities

June 2017

Dear _____

Re: Participation of your child in a research study

My name is Amy Wylie. I am also currently enrolled for a Master's degree in Augmentative and Alternative Communication (AAC) at the Centre for AAC at the University of Pretoria. I would like to request your consent for your child, _____, to participate in a research study.

The title of my study is "*The effect of dual versus mono medium teaching on the ability of functionally bilingual, typically developing children to label graphic symbols in Afrikaans and English*".

Why I want to conduct this study

Children who cannot rely on speech to communicate may need other methods to express themselves. These methods may include picture symbols (also called graphic symbols). Typically, these picture symbols represent one specific language (e.g. English). However, an increasing number of people in South Africa who need these systems come from multilingual backgrounds. At present it is not clear if a child is able to learn a picture symbol in one language and then translate this to another language. This study is starting to explore how bilingual children with typical development may learn picture symbols in two languages. This information will help us to understand how children who cannot speak may be able to learn these picture symbols.

What is expected of your child?

Should you give consent for your child to participate in the study, the following will be expected of him/her:

- Your child will meet me with the teacher present. I will then use pictures to explain what the study is about, and ask your child if he/she agrees to participate.
- If your child agrees, I will screen his/her language abilities in Afrikaans and English.
- This screening procedure will take about 30 minutes.

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Email saak@up.ac.za
www.caac.up.ac.za

- If the screening procedure is passed your child will then be taught the meaning of eight picture symbols in daily individual teaching sessions. Four will be taught in English, and the other four in English and Afrikaans. The first session will commence by asking your child to say what they think the meaning of the first four symbols is. Then they will be taught the meaning of the symbols for two sessions. During the third session, they will be asked to say the meaning of the first four symbols again. The same procedure will be followed for the next four symbols. Altogether, 5 sessions are planned on 5 consecutive days. Each session will last about 10 minutes.
- After each session, your child will be given a sticker as a token of appreciation for his/her participation.
- All interactions during the study will be video recorded in order for me to ensure that I execute the procedures correctly. The focus of the camera will be on me and the picture symbols, rather than on your child.

Should you give consent for your child to participate, we would also please ask you to complete the attached brief background questionnaire.

What are your child's rights?
This study was approved by the Ethics Committee of the Faculty of Humanities at the University of Pretoria. Participation in the research is voluntary. You may withdraw your child or your child may withdraw from the study at any point in time. All data pertaining to your child will then be immediately destroyed. There will be no negative consequences for yourself or your child if you or your child decide to stop taking part.

All data pertaining to your child will be kept strictly confidential, and will only be available to myself, my supervisor and one independent rater. When reporting on the results of the study, all identifying information pertaining to you, your child or the school will be removed.

Who will have access to the results of the study?
The research will be stored in both hard copy and electronic format at the University of Pretoria in the Centre for Alternative and Augmentative Communication for 15 years. The data obtained from the research will be used for writing a Master's dissertation, writing scientific papers and for presentation at professional conferences and seminars. A summary of the results will be made available for any interested staff or parents. However, your child's identity will never be revealed. Data may be used for secondary data analysis.

What are the risks and benefits?
At no time during the participation in the research will your child be at risk of any harm. Your child will be made aware that the procedures are not aimed at testing him or her, but rather for me to understand how children think about and learn about pictures. Their teacher will be consulted about an appropriate time to remove your child from the class

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to ensure that they do not lose out on valuable class time.

Potential benefits of this study may include a better understanding about how to use picture symbols to enhance the communication of children from multilingual backgrounds who cannot speak.

I would appreciate your consideration of my request. I would be grateful if you could complete the reply slip attached to indicate whether or not you give permission for your child to participate in the study. If you do give permission, would you kindly also complete the biographical information questionnaire about your child. Please feel free to contact me or my supervisor if you have any questions about this study. I look forward to receiving your response.

Kind regards,

Amy Wylie
Email: XXXXXXXX
Cell number XXXXXXX

Date

Dr Kerstin Tönsing
Centre for Augmentative and Alternative Communication
kerstin.tonsing@up.ac.za
012 420 4729

Date

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Faculty of Humanities

Parental Informed Consent: Reply Slip

Name of child: _____

Name of parent: _____

Project title: *The effect of dual versus mono medium teaching on the ability of functionally bilingual, typically developing children to label graphic symbols in Afrikaans and English.*

Researcher: Amy Wylie
Master's candidate
Centre for AAC
Cell:

Supervisor: Dr Kerstin Tönsing
Senior lecturer
Centre for AAC
Tel: 012 420 4729

I, _____,
Name and Surname

(*please tick box that applies*)

☐ give consent for my child to participate in this study. My consent is voluntary and I understand that I may withdraw my child's participation at any time. I understand that my child will be video-recorded. I understand that the data will be securely stored for 15 years at the CAAC and that all data will be treated confidentially. I understand that the data may be re-used for analysis. I understand that the data may be used for a scientific article and for conference presentations. I understand that all information used and obtained in this study will be treated as confidential.

OR

☐ do not give consent for my child to participate in this study.

_____ _____
Parent Signature Date

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Appendix C

Parent Biographical Questionnaire

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Biographical questionnaire

Kindly complete the following background questionnaire about _____ (*name of child*). All information will be kept strictly confidential.

General details

Child's name: _____

Child's date of birth: _____

Gender: _____

Child's current age: _____

Current grade at school: _____

Do you have any concerns about your child's vision? Yes No

Do you have any concerns about your child's hearing? Yes No

Do you have any concerns about your child's development? Yes No

(If yes, please specify): _____

Is your child currently receiving speech therapy? Yes No

Is your child currently receiving occupational therapy? Yes No

Is your child currently taking any medication to help him/her concentrate (e.g. Ritalin)? Yes No

Language information

Language(s) spoken at home: _____

Language spoken by: Father _____ Mother _____

Child _____ Siblings _____

Relatives _____ Friends _____

Other caregivers _____

What language does your child most often hear spoken on the radio (if you play the radio at home or in the car)? _____

What language does your child most often hear spoken on the TV (if they are exposed to TV at home)? _____

Siblings and other children living with your child (i.e., in the same home):

Relationship to child	Gender	Age	Language spoken to your child	Other languages spoken

Adults living with your child (i.e., in the same home):

Relationship to child	Gender	Age	Language spoken to your child	Other languages spoken

Please consider the total language exposure your child has at home (i.e., languages he/she hears spoken by others, as well as over the radio and television). Please provide an estimate of the percentage of exposure that the child receives at home:

Afrikaans _____ English _____

Other (please specify language and percentage): _____

Please consider your child's spoken language at home. How much does he/she speak using the following languages? Please provide an estimate percentage:

Afrikaans _____ English _____

Other (please specify language and percentage): _____

Do you feel your child has an age appropriate understanding of:

Afrikaans	Yes	No
English	Yes	No

Do you feel your child has an age appropriate ability to express him-/herself in:

Afrikaans	Yes	No
English	Yes	No

Thank you for taking the time to complete this questionnaire.

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Appendix D

Assent Script and Form

Hello, my name is Amy.

I want to ask whether you will work with me. If you say yes, this is what we will do:

First, I will show you some pictures in a book and ask you to point to some of them.

On another day I will show you some pictures and ask you to tell me what they are.

After that, I will teach you the names of the pictures. Then we will see if it is easier for you to tell me what the pictures are.

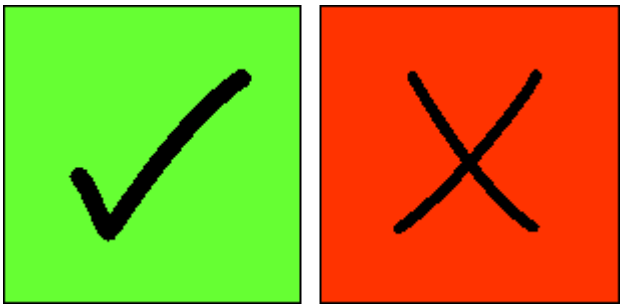
I will videotape how we work together, so that other people can see if I do a good job teaching you the pictures.

If you want to stop or go back to class, you can tell me or point to the stop sign. Then we will go back to class.

	**Do you understand everything I explained to you?** **YES** **NO**
	**Do you understand that it is your choice to help me today?** **YES** **NO**
	**Do you understand that you can stop anytime you want to?** **YES** **NO**
	**Do you understand that I will be videotaping you today?** **YES** **NO**
	**Do you have any questions?** **YES** **NO**
	**Are you happy with the way your questions were answered?** **YES** **NO**
	**Do you want to work with me today?** **YES** **NO**

Picture symbols which the potential participant can use to answer

Yes No



Appendix E

Teacher Biographical Questionnaire

Biographical questionnaire

Kindly complete the following background questionnaire about _____ (*name of child*). All information will be kept strictly confidential.

Does the child have functional hearing skills?	Yes	No
Does the child have functional vision?	Yes	No
Does the child have age appropriate visual processing skills?	Yes	No
Does the child have age appropriate concentration?	Yes	No

Language of instruction at school: _____

Do you feel that the child has age appropriate language skills in (*add language of instruction*)? Yes No

Please indicate which languages the child speaks to the teachers/assistants at school. Please also estimate the percentage of time the child uses this language:

Language	Percentage of time child uses this language

Please indicate which languages the child speaks to their peers at school. Please also estimate the percentage of time the child uses this language:

Language	Percentage used by child

Thank you for taking the time to complete this questionnaire.

Appendix F

Sentence Completion Task

Sentence completion task pictures and instructions

(First do all pictures using English and then using Afrikaans)

I am going to show you some pictures and ask you some questions about them. Are you ready?

Ek gaan vir jou 'n paar prentjies wys en jou 'n paar vragies daaroor vra. Is jy gereed?

Old/*oud*:

(*show stimulus pictures*) This boy is young. This grandfather is not young, he is… (*pause for 5 seconds, record response*).

(show stimulus pictures) *Hierdie seun is jonk. Hierdie oupa is nie jonk nie, hy is…* (pause for 5 seconds, record response).

Pretty/*mooi*:

(*show stimulus pictures*) This monster is ugly. This princess is not ugly, she is… (*pause for 5 seconds, record response*).
(show stimulus pictures) *Hierdie monster is lelik. Hierdie prinses is nie lelik nie, sy is…* (pause for 5 seconds, record response).

Slow*/stadig:*

(*show stimulus pictures*) This car is fast. This truck is not fast, it is… (*pause for 5 seconds, record response*).
(show stimulus pictures) *Hierdie kar is vinnig. Hierdie trok is nie vinnig nie, dit is…* (pause for 5 seconds, record response).

Long*/lank*:

(*show stimulus pictures*) I have two sticks. This stick is hort. This tick is not short, it is… (*pause for 5 seconds, record response*).
(show stimulus pictures) Ek het twee stokke. *Hierdie een is kort. Hierdie een is nie kort nie, dit is…* (pause for 5 seconds, record response).

Clean/*skoon*:

(*show stimulus pictures*) These clothes are dirty. Mommy washed them. Now they are not dirty anymore, they are… (*pause for 5 seconds, record response*).
(show stimulus pictures) *Die klere is vuil. Mamma het dit gewas. Dit is nou nie meer vuil nie, dit is…* (pause for 5 seconds, record response).

Empty/*leeg*:

(*show stimulus pictures*) This glass is full. This glass is not full, it is… (*pause for 5 seconds, record response*).
(show stimulus pictures) *Hierdie glas is vol. Hierdie glas is nie vol nie, dit is…* (pause for 5 seconds, record response).

Heavy/*swaar*:

(*show stimulus pictures*) This small box is light. This big box is not light, it is… (*pause for 5 seconds, record response*).

(show stimulus pictures) *Hierdie klein boks is lig. Hierdie groot boks is nie lig nie, dit is…* (pause for 5 seconds, record response).

Open/*oop*:

(*show stimulus pictures*) This door is closed. This door is not closed, it is… (*pause for 5 seconds, record response*).

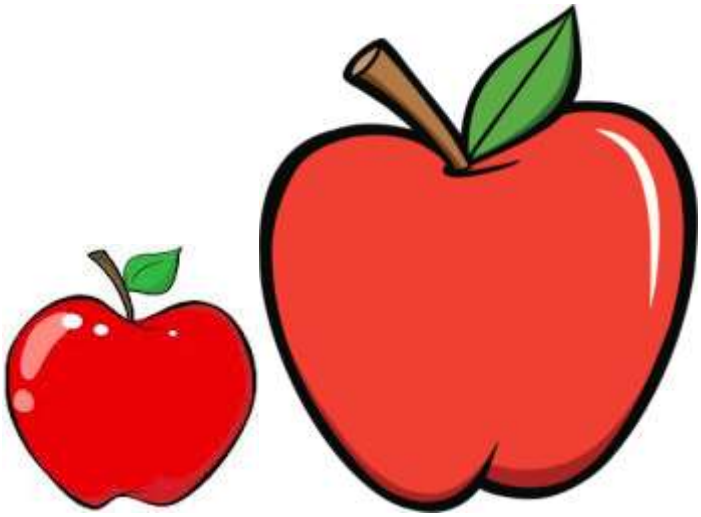
(show stimulus pictures) *Hierdie deur is toe. Hierdie deur is nie toe nie, dit is…*

(pause for 5 seconds, record response).

Wet/*nat*:

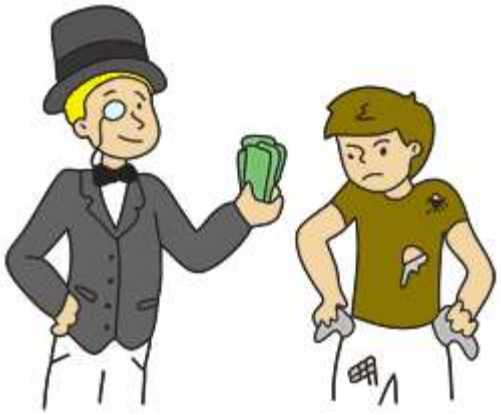
(*show stimulus pictures*) It is raining. Sarah has an umbrella, so her clothes are dry. Betty does not have an umbrella, so her clothes are not dry, they are… (*pause for 5 seconds, record response*).
(show stimulus pictures) Dit reën. Sarie het ‘n sambreel, so haar klere is droog. Bettie het nie ‘n sambreel nie, so haar klere *is nie droog nie, hulle is…* (pause for 5 seconds, record response).

Big/*groot*:



(*show stimulus pictures*) This apple is small. This apple is not small, it is… (*pause for 5 seconds, record response*).
(show stimulus pictures) *Hierdie appel is klein. Hierdie appel is nie klein nie, dit is…* (pause for 5 seconds, record response).

Poor/*arm*:



(*show stimulus pictures*) This man has lots of money. He is rich. This man has no money. He is not rich, he is… (*pause for 5 seconds, record response*).
(show stimulus pictures) D*ie man het baie geld. Hy is ryk. Die man het geen geld nie. Hy is nie ryk nie, hy is…* (pause for 5 seconds, record response).

Hot/*warm*:

(*show stimulus pictures*) Ice cubes are cold. A fire is not cold, it is… (*pause for 5 seconds, record response*).
(show stimulus pictures) *Ysblokkies is koud. 'n Vuur is nie koud nie, dit is…* (pause for 5 seconds, record response).

Straight/*reguit*:

(*show stimulus pictures*) This girl's hair is curly. This girl's hair is not curly, it is… (*pause for 5 seconds, record response*).

(show stimulus pictures) *Hierdie meisie se hare is krullerig. Hierdie meisie se hare is nie krullerig nie, dit is…* (pause for 5 seconds, record response).

Appendix G
Symbol Labelling Checklist

Graphic symbol labelling

Participant: _____

Pre-test 1

Concept	**English**		**Afrikaans**	
	Response	**Score**	**Response**	**Score**
Pretty/*mooi*				
Slow/*stadig*				
Clean/*skoon*				
Empty/*leeg*				
Heavy/*swaar*				
Wet/*nat*				
Big/*groot*				
Hot/*warm*				
Straight/*reguit*				

Post-test 1 & Pre-test 2
[Treatment ___: Set ___]

Concept	**English**		**Afrikaans**	
	Response	**Score**	**Response**	**Score**
Pretty/*mooi*				
Slow/*stadig*				
Clean/*skoon*				
Empty/*leeg*				
Heavy/*swaar*				
Wet/*nat*				
Big/*groot*				
Hot/*warm*				
Straight/*reguit*				

Post-test 2
[Treatment ___: Set ___]

Concept	**English**		**Afrikaans**	
	Response	**Score**	**Response**	**Score**
Pretty/*mooi*				
Slow/*stadig*				
Clean/*skoon*				
Empty/*leeg*				
Heavy/*swaar*				
Wet/*nat*				
Big/*groot*				
Hot/*warm*				
Straight/*reguit*				

Appendix H

Examples of Procedural Integrity Checklists for Treatments Administered

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Procedural Integrity Checklist

Treatment 1: Mono medium teaching in English; Set 1

Session 1

Procedure	Script	Comply
Turn on video recorder.		
	Some people cannot talk with their mouth. They use pictures to talk. I am going to teach you what some of these pictures mean, the pictures that people use to talk. Later I want to see how well/if you can remember what the pictures mean. Are you ready?	
Any comments (other than responses to the mands) by the child will be acknowledged as far as possible. When comments are off task, children will be reminded to focus by comments **such as**	(**Example**) You can tell me about this later, let me first finish telling you about this picture.	
Four PCS presented, determined by results of pre-test.		
Show PCS for *pretty*		
	This picture means 'pretty'. The picture shows a rainbow and some flowers. The rainbow and flowers are not ugly, they are pretty. That is why the picture means 'pretty'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'pretty'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'pretty'.	
Show PCS for *clean*		
	This picture means 'clean'. The picture shows a shiny, white cloth. The cloth is not full of mud and dirty, it is clean. That is why the picture means 'clean'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'clean'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'clean'.	
Show PCS for *heavy*		
	This picture means 'heavy'. The picture shows a big cement weight that is very difficult to pick up. It is not light, it is heavy. That is why the picture means 'heavy'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'heavy'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'heavy'.	
Show PCS for *big*		
	This picture means 'big'. The picture shows a big black blob. It is not a little dot, it is a big blob covering almost the whole card. That is why the picture means 'big'. So tell me, what does this picture mean?	
Pause to allow child to respond		

Procedure	Script	Comply
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'big'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'big'.	
Show PCS for *straight*		
	This picture means 'straight'. The picture shows three straight lines. The lines are not wiggly and skew, they are straight. That is why the picture means 'straight'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'straight'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'straight'.	
	Now, Let's do it one more time/do it again.	
Show PCS for *pretty*		
	This picture means 'pretty'. The picture shows a rainbow and some flowers. The rainbow and flowers are not ugly, they are pretty. That is why the picture means 'pretty'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'pretty'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'pretty'.	
Show PCS for *clean*		
	This picture means 'clean'. The picture shows a shiny, white cloth. The cloth is not full of mud and dirty, it is clean. That is why the picture means 'clean'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'clean'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'clean'.	
Show PCS for *heavy*		
	This picture means 'heavy'. The picture shows a big cement weight that is very difficult to pick up. It is not light, it is heavy. That is why the picture means 'heavy'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'heavy'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'heavy'.	
Show PCS for *big*		
	This picture means 'big'. The picture shows a big black blob. It is not a little dot, it is a big blob covering almost the whole card. That is why the picture means 'big'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'big'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'big'.	

Procedure	Script	Comply
	You worked so well today.	
Turn off video camera		
Present sticker and sweet choices to the child.		
Return to class	.	

Percentage complied: _____ x100 (number correct)

(number correct + incorrect)

= _____

Treatment 2: Dual medium teaching in Afrikaans and English; Set 2

Session 1

Procedure	Script	Comply
Turn on video recorder.		
	Some people cannot talk with their mouth. They use pictures to talk. I am going to teach you what some of these pictures mean, the pictures that people use to talk. We are going to learn what the pictures mean in English and also in Afrikaans. *Want jy kan mos Engels en Afrikaans praat, né? So ons gaan leer wat beteken die prentjies in Engels e nook in Afrikaans. Later wil ek sien of jy kan onthou wat die prentjies beteken.* Are you ready?	
Any comments (other than responses to the mands) by the child will be acknowledged as far as possible. When comments are off task, children will be reminded to focus by comments **such as**	(**Example**) You can tell me about this later, let me first finish telling you about this picture. *Jy kan my later daarvan vertel, ek wil aseblief eers vir jou klaar vertel oor doe prentjie*	
Four PCS presented, determined by results of pre-test.		
Show PCS for *slow*		
Pause to allow child to respond	This picture means 'slow'. The picture shows a tortoise. A tortoise is not fast, it is very slow. That's why the picture means 'slow'. So tell me, what does this picture mean?	
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'slow'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'slow'.	
Show PCS for *slow*		
	In Afrikaans kan ons sê dat die prentjie 'stadig' beteken. Die prentjie wys 'n skilpad. 'n Skilpad is nie vining nie, hy is baie stadig. Dis hoekom hierdie prentjie 'stadig' beteken. So sê my, wat beteken hierdie prentjie?	
Pause to allow child to respond		
If child responds in English	*Ja, dit is wat die in Engels beteken, maar wat beteken dit in Afrikaans?*	
If incorrect [maximum 3 times]	*Nee, hierdie prentjie beteken nie ___ (insert child's response), dit beteken stadig. Kan jy vir my sê wat die beteken*?	
If correct	*Dis reg/mooi so/goed! Ja, dit beteken 'stadig'.*	
Show PCS for *empty*		
	This picture means 'empty'. The picture shows a bowl. The bowl has nothing in it. It is not full, it is empty. That is why the picture means 'empty'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'empty'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'empty'.	
Show PCS for *empty*		
	In Afrikaans kan ons sê dat die prentjie 'leeg' beteken. Die prentjie wys 'n bak, Die bak het niks binne-in nie. Dis nie vol nie, dis leeg. Dis hoekome	

Procedure	Script	Comply
	hierdie prentjie 'leeg' beteken. *Dis hoekom hierdie prentjie 'leeg' beteken. So sê my, wat beteken hierdie prentjie?*	
Pause to allow child to respond		
If child responds in English	*Ja, dit is wat die in Engels beteken, maar wat beteken dit in Afrikaans?*	
If incorrect [maximum 3 times]	*Nee, hierdie prentjie beteken nie ___ (insert child's response), dit beteken 'leeg'. Kan jy vir my sê wat die beteken?*	
If correct	*Dis reg/mooi so/goed! Ja, dit beteken 'leeg'.*	
Show PCS for *wet*		
	This picture means 'wet'. The picture shows a piece of soap and the water is flowing over it. The soap is not dry, it is wet. That is why the picture means 'wet'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'wet'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'wet'.	
Show PCS for *wet*		
	In Afrikaans kan ons sê dat die prentjie 'nat' beteken. Die prentjie wys 'n stukkie seep en die water vloei oor die seep. Die seep is nie droog nie, dit is nat. Dis hoekom hierdie prentjie 'nat' beteken. Dis hoekom hierdie prentjie 'nat' beteken. So sê my, wat beteken hierdie prentjie?	
Pause to allow child to respond		
If child responds in English	*Ja, dit is wat die in Engels beteken, maar wat beteken dit in Afrikaans?*	
If incorrect [maximum 3 times]	*Nee, hierdie prentjie beteken nie ___ (insert child's response), dit beteken 'nat'. Kan jy vir my sê wat die beteken?*	
If correct	*Dis reg/mooi so/goed! Ja, dit beteken 'nat'.*	
Show PCS for *hot*		
	This picture means 'hot'. The picture shows a thermometer with an arrow pointing up. The thermometer tells us that is is not cold, it is hot. That is why the picture means 'hot'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'hot'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'hot'.	
Show PCS for *hot*		
	In Afrikaans kan ons sê dat die prentjie 'warm' beteken. Die prentjie wys 'n termometer met 'n pyltjie wat boontoe wys. Die termometer sê vir ons dat dit nie koud is nie. Dit is warm. Dis hoekom hierdie prentjie 'warm' beteken. Dis hoekom hierdie prentjie 'warm' beteken. So sê my, wat beteken hierdie prentjie?	
Pause to allow child to respond		
If child responds in English	*Ja, dit is wat die in Engels beteken, maar wat beteken dit in Afrikaans?*	

Procedure	Script	Comply
If incorrect [maximum 3 times]	*Nee, hierdie prentjie beteken nie ___ (insert child's response), dit beteken 'warm'. Kan jy vir my sê wat die beteken?*	
If correct	*Dis reg/mooi so/goed! Ja, dit beteken 'warm'.*	
Show PCS for *straight*		
	This picture means 'straight'. The picture shows three straight lines. The lines are not wiggly and skew, they are straight. That is why the picture means 'straight'. So tell me, what does this picture mean?	
Pause to allow child to respond		
If incorrect [maximum 3 times]	No, this picture does not mean ___ (*insert child's response*), it means 'straight'. Can you tell me what it means?	
If correct	Good/well done/great! Yes, it means 'straight'.	
Show PCS for *straight*		
	In Afrikaans kan ons sê dat die prentjie 'reguit' beteken. Die prentjie wys drie reguit lyntjies. Die lyntjies is nie krom en skeef nie, dit is reguit. Dis hoekom hierdie prentjie 'reguit' beteken. So sê my, wat beteken hierdie prentjie?	
Pause to allow child to respond		
If child responds in English	*Ja, dit is wat die in Engels beteken, maar wat beteken dit in Afrikaans?*	
If incorrect [maximum 3 times]	*Nee, hierdie prentjie beteken nie ___ (insert child's response), dit beteken 'reguit'. Kan jy vir my sê wat die beteken?*	
If correct	*Dis reg/mooi so/goed! Ja, dit beteken 'reguit'.*	
	You worked so well today.	
Turn off video camera		
Present sticker and sweet choices to the child.		
Return to class	.	

Percentage complied: _____ x100 (number correct)

(number correct + incorrect)

= _____

Appendix I
Pre- and Post-Test Procedural Checklist

Pre/Post-Test Procedural Script

Participant: _____ Pre-test or Post-test (*circle one*)

Procedure	Script	Comply
Turn on video recorder.		
	I am going to show you some pictures. I want you to tell me what these pictures mean using English words.	
Show PCS for *pretty*		
	What does this picture mean?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Okay/hmmm/nice/good try	
Show PCS for *slow*		
	What does this picture mean?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Okay/hmmm/nice/good try	
Show PCS for *clean*		
	What does this picture mean?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Okay/hmmm/nice/good try	
Show PCS for *empty*		
	What does this picture mean?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Okay/hmmm/nice/good try	
Show PCS for *heavy*		
	What does this picture mean?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Okay/hmmm/nice/good try	
Show PCS for *wet*		
	What does this picture mean?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Okay/hmmm/nice/good try	
Show PCS for *big*		
	What does this picture mean?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Okay/hmmm/nice/good try	
Show PCS for *hot*		
	What does this picture mean?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Okay/hmmm/nice/good try	
	Nou wil ek die prentjies vir jou weer wys. Ek wil hê dat jy vir my sê wat hierdie prentjies beteken as jy Afrikaans woorde gebruik.	

Procedure	Script	Comply
Order of pictures to be randomised		
Show PCS for *pretty*		
	Wat beteken hierdie prentjie?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Hmmm/mooi/ baie goed	
Show PCS for *slow*		
	Wat beteken hierdie prentjie?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Hmmm/mooi/ baie goed	
Show PCS for *clean*		
	Wat beteken hierdie prentjie?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Hmmm/mooi/ baie goed	
Show PCS for *empty*		
	Wat beteken hierdie prentjie?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Hmmm/mooi/ baie goed	
Show PCS for *heavy*		
	Wat beteken hierdie prentjie?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Hmmm/mooi/ baie goed	
Show PCS for *wet*		
	Wat beteken hierdie prentjie?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Hmmm/mooi/ baie goed	
Show PCS for *big*		
	Wat beteken hierdie prentjie?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Hmmm/mooi/ baie goed	
Show PCS for *hot*		
	Wat beteken hierdie prentjie?	
Wait up to 5 seconds for response		
Record child's response		
Neutral response	Hmmm/mooi/ baie goed	
	Jy het baie mooi gewerk vandag. Wil jy 'n sticker kies vir jou goeie werk?	
Turn off video camera		

Percentage complied: _____ x100 (number correct)
(number correct + incorrect)

= _____

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Appendix J
Ethics Approval

UNIVERSITEIT VAN PRETORIA
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UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Research Ethics Committee

24 March 2017

Dear Bornman

Project:	**The effect of dual versus medium teaching on the ability of bilingual, typically developing children to label graphics symbols in L1 and L2**
Researcher:	**A Wylie**
Supervisor:	**Prof J Bornman**
Department:	**Centre for Augmentative and Alternative Communication**
Reference number:	**24269442 (GW20161017HS)**

Thank you for your response to the Committee's correspondence of 3 November 2016.

The **Research Ethics Committee** notes that the outstanding permission from the *school* was submitted as requested and has therefore given **final approval** for the above application at an *ad hoc* meeting on 24 March 2017. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

The Committee requests you to convey this approval to the researcher.

We wish you success with the project.

Sincerely

Prof Maxi Schoeman
Deputy Dean: Postgraduate and Research Ethics
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail: tracey.andrew@up.ac.za

Appendix K
Symbol Explanations

Symbol Explanations

English

Pretty: This picture means ‘pretty’. The picture shows a rainbow and some flowers. The rainbow and flowers are not ugly, they are pretty. That is why the picture means ‘pretty’.

Slow: This picture means ‘slow’. The picture shows a tortoise. A tortoise is not fast, it is very slow. That’s why the picture means ‘slow’.

Clean: This picture means ‘clean’. The picture shows a shiny, white cloth. The cloth is not full of mud and dirty, it is clean. That is why the picture means ‘clean’.

Empty: This picture means ‘empty’. The picture shows a bowl. The bowl has nothing in it. It is not full, it is empty. That is why the picture means ‘empty’.

Big: This picture means ‘big’. The picture shows a big black blob. It is not a little dot, it is a big blob covering almost the whole card. That is why the picture means ‘big’.

Wet: This picture means ‘wet’. The picture shows a piece of soap and the water is flowing over it. The soap is not dry, it is wet. That is why the picture means ‘wet’.

Heavy: This picture means ‘heavy’. The picture shows a big cement weight that is very difficult to pick up. It is not light, it is heavy. That is why the picture means ‘heavy’.

Hot: This picture means ‘hot’. The picture shows a thermometer with an arrow pointing up. The thermometer tells us that it is not cold, it is hot. That is why the picture means ‘hot’.

Straight: This picture means ‘straight’. The picture shows three straight lines. The lines are not wiggly and skew, they are straight. That is why the picture means ‘straight’.

Afrikaans

***Mooi**: In Afrikaans kan ons sê dat die prentjie 'mooi' beteken. Die prentjie wys 'n reënboog en 'n paar blomme. Die reënboog and die blomme is nie lelik nie, hulle is mooi. Dis hoekom hierdie prentjie 'mooi' beteken.*

***Stadig**: Hierdie prentjie beteken 'stadig' Die prentjie wys 'n skilpad. 'n Skilpad is nie vining nie, hy is baie stadig. Dis hoekom hierdie prentjie 'stadig' beteken.*

***Skoon**: Hierdie prentjie beterken 'skoon.' Die prentjie wys 'n blink wit doek. Die doek is nie vol modder en vuil nie, dit is skoon. Dis hoekom hierdie prentjie 'skoon' beteken.*

***Leeg**: Hierdie prentjie beteken 'leeg'. Die prentjie wys 'n bak, Die bak het niks binne-in nie. Dis nie vol nie, dis leeg. Dis hoekome hierdie prentjie 'leeg' beteken. Dis hoekom hierdie prentjie 'leeg' beteken.*

***Groot**: Hierdie prentjie beteken groot. Die prentjie wys 'n groot swart kol. Dis nie 'n klein kolletjie nie, dis 'n groot kol wat amper die hele kaartjie toemaak. Dis hoekom hierdie prentjie 'groot' beteken. Dis hoekom hierdie prentjie 'groot' beteken.*

***Nat**: Die prentjie beteken 'nat'. Die prentjie wys 'n stukkie seep en die water vloei oor die seep. Die seep is nie droog nie, dit is nat. Dis hoekom hierdie prentjie 'nat' beteken. Dis hoekom hierdie prentjie 'nat' beteken.*

***Swaar**: Hierdie prentjie beteken 'swaar.' Die prentjie wys 'n swaar sement gewig wat baie moeilik is om op te tel. Dit is nie lig nie, dit is swaar. Dis hoekom hierdie prentjie 'swaar' beteken. Dis hoekom hierdie prentjie 'swaar' beteken.*

***Warm**: Die prentjie beteken 'warm.' Die prentjie wys 'n termometer met 'n pyltjie wat boontoe wys. Die termometer sê vir ons dat dit nie koud is nie. Dit is warm. Dis hoekom hierdie prentjie 'warm' beteken. Dis hoekom hierdie prentjie 'warm' beteken.*

***Reguit**: Die prentjie beteken 'reguit'. Die prentjie wys drie reguit lyntjies. Die lyntjies is nie krom en skeef nie, dit is reguit. Dis hoekom hierdie prentjie 'reguit' beteken.*

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Appendix L
Statement from Language Editor

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Toni Muir
Writer and Editor

To Whom It May Concern,

I hereby confirm that I conducted the language editing of the Master's dissertation/mini-dissertation of Amy Wylie. The document with my edits was sent to the student on 17 November 2017.

Toni Ingrid Muir

17 November 2017