Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)

by

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‘Patience is a Pillar of Faith’

‘And, when you want something. ALL the universe conspires in helping you to achieve it’

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Abstract

Background: Some children with ASD have comprehension difficulties that affect their ability to follow directives that contain prepositions. Aided input has been known to facilitate improved comprehension skills when spoken language is used with graphic symbols.
Aims: This study examined the effects that aided input presented at two levels (20% of aided input and 60% of aided input) has on children with ASD's following of directives that contain prepositions.
Methods: An experimental, within-subjects crossover design was utilised where all participants were exposed to each treatment condition at a different time period. Altogether 21 participants between 5.0 and 11.11 years of age were asked to follow 12 directives using aided input at two conditions. Participants first completed a pre-test task to confirm their noun knowledge, preposition knowledge and matching skills. Participants were described based on the CARS classification and their PPVT-4 scores. The effects of the aided input were measured and compared based on the accuracy of responses.
Results: Descriptive statistics were used to describe the data, and multivariate analysis was used to analyse the data. Some children with ASD (n=9) who received a higher level of aided input (60%) were able to respond more accurately than those who received a lower level of aided input (20%). However, some children with ASD (n=4) responded more accurately to the lower level of aided input (20%) than the higher level of aided input (60%). Some children with ASD (n=5) responded in the same manner for both levels of aided input and some children with ASD (n=3) did not respond at all despite the level of aided input. The results showed no statistically significant difference between the higher (60%) and lower (20%) levels of aided input.
Conclusion: It was concluded that the 60% aided input level yielded a higher accuracy of responses than the 20% aided input level in some children with ASD. In addition, the results suggest that augmenting spoken language was advantageous in some children with ASD. However, further research is needed to better describe the effects of aided input, using graphic symbols. Future research directions are suggested.

Keywords: aided input, aided language stimulation, Augmentative and Alternative Communication (AAC), Autism Spectrum Disorder **(**ASD), directives, prepositions, receptive language skills

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LIST OF ABBREVIATIONS

AAC	Augmentative and Alternative Communication
ASD	Autism Spectrum Disorder
CCN	Complex Communication Needs
PCS	Picture Communication Symbols™
SGD	Speech-Generating Device

1. Research topic

Effects of varied dosage of aided input on the ability of children with Autism Spectrum Disorder (ASD) to follow directives that contain prepositions.

2. Problem statement and literature review

Autism Spectrum Disorder (ASD) is a lifelong, neurodevelopmental disorder with marked deficits in communication, language and social interaction (CDC, 2007; Drager et al., 2006; Schlosser et al., 2013; Shane et al., 2012). Approximately 50% of children diagnosed with ASD are unable to meet their daily communication needs without support (CDC, 2007). It is believed that children with ASD face several communication challenges due to their receptive and expressive language deficits (Beukelman & Mirenda, 2005; Mitchell et al. 2006; Schlosser et al., 2013; WHO, 1993). In most cases, for children with ASD, a greater impairment is found in comprehension skills rather than in expressive skills (Hudry et al., 2010). The impairment in receptive language skills may be attributed to the difficulties that children with ASD experience in processing spoken language (Shane & Alpert, 2008). Although these impairments are known, there is a paucity of research available for guiding practitioners on how to effectively and efficiently teach receptive language skills to children with ASD (Kurt, 2011). Evidence clearly suggests that children with ASD have some difficulty understanding spoken language (Drager et al., 2006) and most of them require alternative methods for language acquisition to promote functional communication (Beukelman & Mirenda, 2005; CDC, 2007). Research is required to focus on receptive language skills (Hudry et al., 2010) of children with ASD.

2.1 Autism Spectrum Disorder (ASD) and Augmentative and Alternative Communication (AAC)

Augmentative and Alternative Communication (AAC) is an area of clinical practice that is used to supplement and/or to provide an alternative to speech by using strategies, symbols, techniques and visual aids (ASHA, 2015). AAC has been known to assist language development and facilitate understanding in children with ASD (Ganz, 2015). It has also been known to be effective in supporting the communication skills in children with ASD (Trembath et al., 2015). Despite documented difficulties with understanding language concepts (Mechling and Hunnicutt 2011), more often than not, children with ASD are presented with spoken input (Hall et al. 1995) regardless of their deficits in comprehending (O'Brien et al., 2016; Von Tetzchner et al., 2004).

AAC may be beneficial for children with ASD (Beukelman & Mirenda, 2005; Light & McNaughton, 2014; Schlosser et al., 2013; Sennott et al., 2016; Shane et al., 2012). Ultimately, access to AAC promotes opportunities for language development, which helps to release the participation restrictions and activity limitations experienced by children with ASD (ASHA, 2015; Beukelman & Mirenda, 2005; Ganz, 2015). Children who require AAC experience challenges in developing expressive language skills, which may be influenced by the number of opportunities available to them to practise their communication skills (Sigafoos, 1999) nor do they have a model of the use of the AAC system (Smith & Grove, 2003). AAC input provides a model of how a communication system can be employed in a natural context where not only the symbols, but also their functions are demonstrated (Romski & Sevcik, 1997). With this, the modes of receptive and expressive language are modelled, and symbols are learned in natural contexts.

Numerous AAC systems exist, but some systems are used more widely with children with ASD. AAC uses multiple modalities for communication, such as speech, vocalising,

signs, gestures, writing, pictures, graphic symbols and speech-generating devices (SGDs) (Beukelman & Mirenda, 2005). Research suggests that the systems should be matched to the characteristics of the children with ASD to improve the ease of their using the system (Ganz, Simpson & Corbin-Newsome, 2008). Children with ASD are known to have strong visual processing skills, and this is one of the reasons why AAC – especially graphic-based AAC systems – may be suitable for them (Ganz et al., 2008; Rao & Gagie, 2006; Shane et al., 2015). According to some research children with ASD may benefit from graphic symbols combined with speech (Drager et al., 2006). Shane et al. (2015), suggests that using graphic symbols may support receptive understanding of concepts and relationships in children with ASD. Various studies suggest that graphic symbols, scene cues, pictures or dynamic cues may improve understanding in children (Mechling & Hunnicutt, 2011; Rao & Gagie, 2006; Remner, Baker, Karter, Kearns, & Shane, 2016; Shane & Alpert, 2008; Trudeau, Sutton & Morford, 2014). However, there remains a debate on what is most effective for children with ASD (Ganz & Simpson, 2004; Schlosser et al., 2013). There are some studies that suggest minimal benefit from visual aids (Trembath et al., 2015).

Children with ASD typically have difficulty in understanding more abstract language concepts such as prepositions which are used frequently in communication (Schlosser et al., 2013). It is generally agreed that graphic symbols may facilitate the comprehension of spoken language in children with ASD (Schlosser et al., 2013). According to Schlosser et al. (2013), research into the receptive acquisition of spoken prepositional directives in children with ASD is limited. Only three intervention studies have so far reviewed children with ASD learning receptive prepositional knowledge by using spoken language (Egel et al., 1984; Goldstein & Brown, 1989; King, Moors, & Fabrizio, 1993). It is highlighted that some children with ASD can benefit from spoken input after being explicitly taught how to follow the directives, the results are limited and cannot be generalised to the ASD population.

Graphic symbols have numerous benefits in supporting communication in children with communication concerns (Romski & Sevcik, 1997; Schlosser et al., 2013). Firstly, graphic symbols such as line drawings or photos are permanent or non-transient, which means that they last longer than spoken language (Romski & Sevcik, 1997). Secondly, they allow children to be more independent and to rely less on the instructor (Romski & Sevcik, 1997). Thirdly, they use a recognition process rather than recall (which is used during spoken language) (Romski & Sevcik, 1997). Fourthly, they aid in improving comprehension skills and they are easy to generate and reuse (Romski & Sevcik, 1997). Lastly, they help to facilitate comprehension of a message by reducing the cognitive demands and providing greater control of the message (Romski & Sevcik, 1997).

2.2 Augmented input

The term *augmented input* was first described by Beukelman and Garrett (1988). Augmented input was used by communication partners who wrote or typed key elements of their messages onto some system that was visually displayed to the individual who was receiving the message (Beukelman & Garrett, 1988). It is an umbrella term that refers to modelling input from two or more modalities (such as: speech, vocalising, signs, gestures, writing or pictures) – one of which must be the AAC system used by the individual, and the other is spoken language (Allen et al., 2017). There are two types of augmented input. Augmented input can be unaided (where it requires no external support or equipment such as gestures or manual signs) or aided (where it requires external support or equipment such as line drawings, photographs or picture boards) (Romski & Sevcik, 1997).

In literature, the terminology used for the term *aided (augmented) input* varies (Romski & Sevcik, 1997). It includes aided language stimulation (Goossens, 1989), natural aided language (Cafiero, 2001), aided language modelling (Drager et al., 2006) and aided

AAC modelling (Binger & Light, 2007). According to Binger et al. (2008), there is a need for integration and clarification in the area of aided input terminology. Furthermore, aided input is an instructional technique that combines simultaneous pointing to graphic symbols while speaking – thus AAC and natural speech techniques are combined (Romski et al., 2010).

A number of reviews highlight aided input as a viable support option for children with disabilities (Allen et al., 2017; Schlosser et al., 2016; Sennot et al., 2016). In 19 single-case studies, it was found that aided input can improve expression (single-word vocabulary and multi-symbol utterances) for individuals with developmental disabilities who use AAC (Allen et al., 2017). Aided input has been recognised to help children acquire new vocabulary and improve some expressive and receptive language skills (Barker, Akaba, Brady, & Thiemann-Bourque, 2013). The effect of aided input on communication outcomes for children with disabilities was recently the subject of three reviews Allen et al. (2017), Sennott et al. (2016), and O'Neil et al. (2018)

Sennot et al. (2016) found linguistic gains in pragmatics (increases in communication turns), semantics (vocabulary increases and receptive skill improvements), syntax (multi-symbol turn increases) and morphology (increases in morphology structures) in the studies they reviewed. Similarly, Allen et al. (2017), noted improvements in single-word vocabulary skills and expression of multi-symbol utterances. However, there were gaps in the literature: comprehension beyond the single-word level was not explored. This is an area suggested for future research. The review by O'Neill et al. (2018) suggested that aided input supports comprehension skills in some children with highlighted improvements in expressive and receptive language for children who use AAC, as well as overall enhanced quality of life.

In their review of the literature, Brock and Allen (2017) promote the quantification of variables such as dosage. Whilst the benefits of aided input have been identified and confirmed in earlier research, little is known about the dosage of aided input (Sennott et al.,

2016). The dosage of aided input can be described as the frequency with which input is provided during the sessions (Allen et al., 2017). In other words, frequency (as mentioned by Dada and Alant (2009)) refers to the number of times the communication partner points to the image. The information gathered in this way can be used to maximise language outcomes in the chosen population as well as to support clinical decision making (Brock & Allen, 2017). In their suggestions for future research, Sennott et al. (2016) strongly promote research into dosage levels. From the discussion above, it emerges that there are significant gaps in the field and a need for current research.

Additionally, these reviews focused on children with developmental disabilities broadly and not children with ASD specifically. Hence, a systematic search for literature related to aided input and children with ASD was conducted.

2.3 Systematic search of aided input

The aim of the systematic search was to describe the findings of studies investigating the effect of aided input in children with ASD. The search terms included "Child with ASD" OR "Child with Autism" OR "Autistic child" AND "AAC modelling" OR "visual supports" OR "aided input" OR "augmented input" OR "aided language input" OR "aided augmented input" OR "aided language modelling" OR "natural aided language" AND "receptive language" OR "following directives" OR "receptive vocabulary" OR "receptive communication" OR "instructions". The databases that were searched were EBSCOhost (main search engine); Medline; Cumulative Nursing and Allied Health Literature (CINAHL); Health Source: Nursing/Academic Edition; PsycINFO; Education Resources Information Clearinghouse (ERIC); and African Index Medicus. Additional articles were found using hand searches.

Table 1 was used to identify studies for abstract and title level screening followed by full text review. Specific exclusion and inclusion criteria were applied to the identified articles as outlined in Table 1.

Table 1

Criteria for study selection

	Inclusion criteria	**Exclusion criteria**
Population	Children with ASD	Adult or children with other neurodevelopmental disorders/typical development/mental disorders/visual impairment/hearing impairment
Age of population	Children 0 to 18 years	All those older than 18 years
Intervention	Augmented aided input (including: AAC modelling, aided input, aided language input, aided augmented input, aided language modelling, natural aided language)	Spoken language input
Outcome	Comprehension skills Receptive language skills Receptive vocabulary Following directives Receptive communication Instructions	Expressive skills only Expressive language skills only
Date	Studies between 1970 and 2018	Studies prior to 1970
Type/Design	Experimental studies (true experimental, quasi-experimental, group designs, single subject experimental designs)	Pre-experimental studies (pre-post designs) Case studies/Qualitative studies/Observational studies/Literature reviews/Systematic reviews/Metanalysis
Source	Peer-reviewed articles	Unpublished dissertations
Language	English	Any other language

Figure 1 below illustrates the PRISMA (Preferred Reporting Items Standards for Systematic Reviews and Meta-Analyses) flow diagram which was used to identify the articles for inclusion. This method was chosen as it is standardised reporting guideline to present transparent and complete review (Hutton et al., 2015).

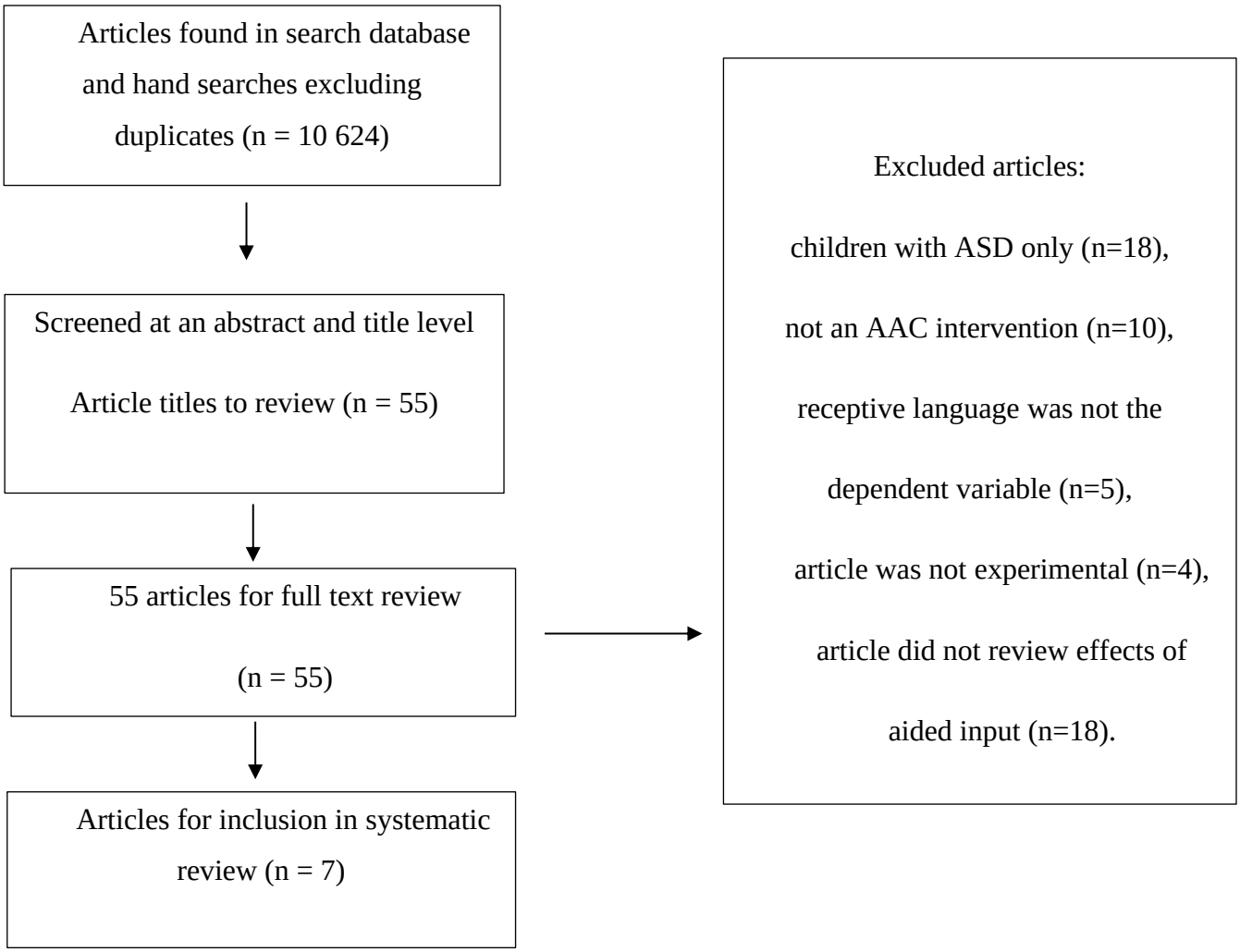

Figure 1. PRISMA flow diagram of search process for studies included in systematic search.

Figure 1 above illustrates that 10 624 articles were found in the database excluding duplicates. These articles were further screened using their abstracts and titles.

The exclusion criteria above were used. Articles were excluded that did not include children with ASD only (n=18), examine AAC intervention (n=10), where receptive language was not the dependent variable (n=5), when the article was not experimental (n=4) and when the article did not review the effects of aided input (n=18).

Table 2 below outlines the design, aims, procedures, independent variable and dependant variable as well as the results of the 7 included studies.

Table 2

Systematic search of studies related to aided input in children with ASD

No.	Author and year Title of study	Study Design	Aim and procedure	IV/DV	Description of participants and age	Results
1	Brady et al. (2015) Investigating a multimodal intervention for children with limited expressive vocabularies associated with autism.	Experimental study design: single subject using a multiple-probe design.	A multimodal intervention composed of speech sound practice and AAC was used to teach individualized vocabulary words that were selected on the basis of initial speech sound repertoires and principles of phonotactic probability and neighbourhood density.	IV: Intervention package (including AAC). DV: Receptive and expressive skills.	Ten children with ASD and limited expressive vocabularies at the outset of the study. Ages: 6.0-10.0.	The results indicated that multimodal intervention leads to increased spoken word productions for some school-age children with minimal verbal skills who attend educational programs for children with ASD. It also reported an improvement in receptive skills for some (half) of the children.
2	Drager et al. (2006) The effect of aided language modelling (ALM) on symbol comprehension and production in 2 preschoolers with autism.	Multiple baseline single-case study design was used to review two children and their response to AAC intervention techniques.	A review of vocabulary pre-intervention and post-intervention; children were given play-based activities with prompting in the form of a paper AAC board. Each child participated in three experimental conditions for each group of vocabulary: baseline, intervention, and maintenance.	IV: Aided language modelling (ALM) intervention. DV: There were four dependent variables: (a) number of target items correctly identified when responding to graphic and verbal stimuli, (b) number of target items correctly identified when responding to graphic stimuli only, (c) number of target items correctly identified when responding to verbal stimuli only, and (d) number of referents correctly labelled using graphic symbols.	Two children with ASD with appropriate matching skills, intellectual impairments and a maximum of 30 functional words. Ages 4.0-5.0.	The results indicated that there was an increase in receptive and expressive vocabulary overall when aided language modelling was used. However further investigation into aided language modelling is recommended and how to use it in natural contexts and more functionally.

#	Author and year Title of study	Study Design	Aim and procedure	IV/DV	Description of participants and age	Results
3	Ganz et al. (2015) Impact of PECS tablet computer app on receptive identification of pictures given a verbal stimulus.	Multiple baseline single-case experimental design was used to review one child.	The purpose was to investigate the impact of using a tablet computer app on the receptive picture identification skills in children with ASD. The researchers manipulated the sound (by having the sound on and then off) and compared the receptive identification of words in each case (with the sound on and with the sound off).	IV: Instruction using PECS with sound. DV: Receptive language skills and identification of words.	One child with ASD Age: 4.0.	Although a functional relation between the intervention and the dependent variable was not established, the intervention did appear to result in mild improvement for two of the three vocabulary words selected. This suggests that there was a slight impact on receptive identification.
4	O'Brien et al. (2016) Brief Report: Just-in-Time visual supports to children with autism via the Apple Watch®: A pilot feasibility study.	Experimental within-subjects design.	This study aimed to (a) explore whether JIT-delivered scene cues (photos, video clips) via the Apple Watch® enable children with ASD to carry out directives they were unable to implement with speech alone, and (b) test the feasibility of the Apple Watch® (with a focus on display size) for supplementing spoken language for children with ASD who have difficulties following spoken directives.	IV: Scene cues with spoken cues. (Augmented input) DV: Directive implementation.	Five children with ASD were matched with a specific criterion Ages: 8.0-13.9.	The results indicated that the hierarchical JIT supports enabled five children with ASD to carry out the majority of directives. Hence, the relatively small display size of the Apple Watch® does not seem to hinder children with ASD to take in critical information from visual supports.
5	Preis, J. (2006) The effects of picture communication symbols on the verbal comprehension of commands by young children with autism.	Experimental research using 2 alternating conditions; with graphic symbols and without graphic symbols.	The purpose of this study was to examine the effects of spoken language with graphic symbols and without graphic symbols. Instructions were given using a developmental (chronological) order.	IV: Verbal response with graphic symbols. DV: Response to instructions/commands.	Five children with ASD. Ages: 5.0 to 7.0.	The study found there was no difference between the verbal instruction alone and the verbal instruction with the visual aids. However, when comparing two different therapists, instructions with the verbal paired with the visuals had higher scores and an improved generalization after a few weeks.

#	Author and year Title of study	Study Design	Aim and procedure	IV/DV	Description of participants and age	Results
6	Remner et al. (2016) Use of augmented input to improve understanding of spoken directives by children with moderate to severe autism spectrum disorder.	An experimental study: within-subjects design was used.	The purpose of this investigation was to explore whether augmented input (using spoken language and a form of static and dynamic scene cues simultaneously) improved language comprehension of prepositional phrases for moderately to severely impaired children with ASD. This study aimed to identify findings similar to Schlosser et al. (2013).	IV: Augmented input in the form of static and dynamic cues. DV: Understanding (comprehension) of spoken directives using accuracy of responses.	Ten children with an ASD diagnosis; The study is an extension of Schlosser et al. (2013).	The study found that scene cues (both static and dynamic) demonstrated improved comprehension of prepositions and a greater accuracy following spoken prepositional directives. This suggests that children with moderate to severe ASD respond more accurately to verbal instructions when paired with visual supports-compared to verbal directives alone.
7	Schlosser et al. (2013) Implementing directives that involve prepositions with children with autism: A comparison of spoken cues with two types of augmented input.	A within-subjects design involving children with ASD or pervasive developmental disorders-not otherwise specified was used to examine the effectiveness of the three input conditions.	9 children with ASD or pervasive developmental disorders-not otherwise Specified. The children were presented with spoken input only, then spoken input with aided input (in the form of static scene cues), then spoken input with aided input (in the form of dynamic cues).	IV: Spoken cues (Augmented input). DV: Directive implementation.	Nine children with ASD or pervasive developmental disorders-not otherwise specified were used to examine the effectiveness of the three input conditions. The children ranged in ages: from 3.9 – 16.8, with a mean of 8.7.	The results indicated that both static scene cues and dynamic scene cues were more effective than spoken cues alone, but there were no differences between static scene cues and dynamic scene cues.

Table 2 described the included studies (n=7) from the systematic search. The main findings of the systematic search are highlighted below.

Studies (n=5) investigated the role of visual supports on comprehension of children with ASD and seemed to agree that aided input is beneficial in improving receptive language skills (Drager et al., 2006; Ganz et al., 2015; O'Brien et al. 2016; Remner et al., 2016; Schlosser et al., 2013;). In these studies, speech is simultaneously used with and without graphic symbols or static/dynamic cues. Majority of the results suggest an improvement in receptive skills when speech is used with graphic symbols or static/dynamic cues. The designs are strong and conclusions acknowledged that further research is suggested.

The study by Schlosser et al. (2013) mentioned that the nine children with ASD who participated in the study were more likely to follow directives when input was provided using aided input, as opposed to when speech was used on its own. Schlosser et al. (2013) compared responses to spoken input with two aided input modalities (static scene cues and dynamic scene cues). The data from this study further supports the argument that it is problematic if spoken cues are used as the primary mode of instruction for children with ASD (Hall et al., 1995) and should be presented through augmented means, using visual aids and speech, as opposed to speech on its own. Remner et al. (2016) repeated the study by Schlosser et al. (2013) and supported these results. Remner et al. (2016) investigated and agreed that the use of scene cues (with speech) improved the comprehension of prepositions in children with ASD when compared to a spoken directive on its own.

Ganz et al. (2015) study measured mixed results when investigating receptive picture identification skills when using a tablet computer application on children with ASD. In this study, the researchers manipulated the sound on the application and compared the receptive identification of words when the sound was 'on' and then 'off' (Ganz et al., 2015). There was a strong, clear functional relation between the simultaneous use of speech and visual aids and

the receptive identification; the intervention did appear to improve levels of responding for two of the target words in these children with ASD. Drager et al. (2006) examined the effectiveness of an aided language modelling (ALM) on symbol comprehension and expression in two preschool children with ASD who used few words functionally, by using play activities and providing graphic symbols during play. It was discovered that both participants demonstrated increased symbol comprehension and elicited symbol production and maintained this. ALM was an effective intervention to increase symbol comprehension. O'Brien et al. (2016) evaluated the use of scene cues (presented on an Apple Watch®) when paired with spoken directives. The results suggested that JIT-delivered scene cues enabled five children with ASD to carry out directives that they were unable to carry out when provided with spoken input alone.

However, studies (n=2) investigated the role of visual supports on comprehension of children with ASD and seemed to suggest that aided input made no difference or made a small difference. The study by Brady et al. (2015) measured that multimodal intervention (using speech and graphic symbols) could improve receptive skills in children with ASD. Brady et al. (2015) suggested that a notable difference (between speech alone and the simultaneous speech with the graphic symbols) was only highlighted for half of the participants. In their study, Preis et al. (2006) evaluated the effects of PCS on the verbal comprehension of commands by children with ASD. The results from the study seemed to note no difference between the speech alone and the simultaneous speech with the visuals. Preis (2006), compared the presence and absence of graphic symbols when giving verbal directives and discovered there was no therapeutic difference between the treatments with a graphic symbol however there was better maintenance of the skills learned when this was reviewed weeks later.

The procedures followed in the studies above were compared. As can be seen from Table 2, the studies all suggest further evaluation into the effects of using aided input for children with ASD. Each study had a strict inclusion criterion which limits the generalisability of the data. Most of the studies above, examine a small number of participants and some are single case studies. There is evidence to suggest that generalising the findings from the studies is challenging because the ASD population varies on their skills and abilities (Trembath et al., 2015). Although, research has suggested that aided input can help in some cases (Schlosser et al., 2016), more research is needed with children of different age levels and different levels of language development.

These studies have provided a strong foundation for the use of aided input, but their limitations may be used to guide future research directions. Future augmentative communication intervention research should evaluate the effects AAC has on children with ASD and evaluate the functional use of aided input (Drager et al., 2006). It should also evaluate the effects of aided input as the sole independent variable and examine its effect on comprehension skills (O'Neill et al., 2018). Future research should examine the relative effects of different types of AAC systems and instructional approaches, as well as other child and intervention-related factors (Ganz et al., 2015; Ganz et al., 2008). It should also evaluate and quantify dosage of input and consider cognitive abilities when identifying the relationship between AAC and communication (Schlosser et al., 2013). It should lastly, attempt to, include more participants to further evaluate the effects of the aided input (Schlosser et al., 2013).

3. Methodology

3.1 Research aims

3.1.1 Main aim

The main aim of the study was to determine the effects that varied dosages of aided input have on the ability of children with ASD to follow directives that contain prepositions.

3.1.2 Sub-aims

The sub-aims of the study were as follows:

i. To determine the effects of approximately 20% aided input (Condition 1) on the accuracy of responses to directives that contain prepositions

ii. To determine the effects of approximately 60% aided input (Condition 2) on the accuracy of responses to directives that contain prepositions

iii. To compare the effects of varied dosages of aided input (Condition 1 and 2) have on the ability of children with ASD to follow directives that contain prepositions.

3.2 Research design

An experimental, within-subjects crossover design was utilised in the study (McMillan & Schumacher, 2010). In this design, all participants were exposed to each treatment condition, but at a different time period (Piantadosi, 2005). The design was advantageous as it allowed every participant to be exposed to both conditions in the experiment. It also yielded a more efficient comparison of treatments. The disadvantage of the design was its carryover effect, which means that the performance in one condition had an impact on the performance in the next condition (Senn et al., 2004). The carryover and order effects were controlled by ensuring that participants were randomly assigned to condition 1 or condition 2, as well as counterbalancing the directives. Since order effects are a threat to the validity of the design, this problem was effectively controlled for in the study.

3.3 Research phases

The current research study had two phases: Pilot study (Phase I) and Main study (Phase II). Both phases consisted of three stages (see Table 3)

Table 3

Research phases

Phases	
Pilot study: Phase I	
1. Adaptation and preparation of instruments and tools *This stage involved obtaining materials and adapting the directives from Schlosser et al. (2013).*	2. Pilot *This stage involved determining the feasibility of the study in terms of recruitment strategy, pre-test task, directive tasks, data collection and procedures.*
Main study: Phase II	
1. Participant recruitment and selection *This phase involved identifying potential participants to be recruited for the study.* 2. Pre-test task and screening *The pre-test and screening tasks were conducted.*	3. Experimental task: Directive task *The experimental directives task was administered and the results were captured.* 4. Analysis of data *Data were analysed using descriptive statistics.*

3.4 Equipment and materials

3.4.1 Equipment

3.4.1.1 An Apple iPhone 8 Plus®.

The Apple iPhone 8 Plus®, with a stand, was used to video record the sessions. This device was operated using the iOS mobile operating system (version 12.3.1), developed by Apple Inc. The recordings were used by an independent observer to ensure reliability and procedural integrity. The video recordings focused on the presentation of the PCS (graphic symbols). The participant's face was not shown in the recordings.

3.4.1.2 An Apple iPad Air 2®.

An Apple iPad Air 2® with the Go Talk application was used to present the PCS. This device was operated using the iOS mobile operating system (version 12.3.1), developed by Apple Inc.

3.4.1.3 iAdapter® (9.7-inch screen size).

An iAdapter®, compatible with the Apple iPad Air 2®, which is an all purpose, protective case with a stand was used to ensure the Apple iPad Air 2® was in vertical alignment. This equipment helped to provide a clear display of the PCS.

3.4.2 Materials

3.4.2.1 Letters

The following letters for permission and consent were used:

3.4.2.1.1 Permission Letter to School Principal

A permission letter (Appendix C) with the title and purpose of the study, the selection of participants and the requirements of the study was given to the school principal. The letter explained that participation in the study was voluntary, that participants could withdraw from the study at any point, that all data collected would remain confidential and that it would be safely stored at the University of Pretoria for 15 years.

3.4.2.1.2 Therapy Unit Letter

The Therapy Unit in the school was requested to complete a letter of consent for the recruitment of participants from the unit (Appendix D). This letter explained the recruitment procedure.

3.4.2.1.3 Teacher Consent letter

The Teacher Consent Letter (Appendix E) was used to request permission from teachers to assist in identifying and recruiting participants. This letter provided information about the study and discussed its objectives as well as the selection criteria for participants. The letter also requested teachers' assistance with sending out the completed consent forms from caregivers.

3.4.2.1.4 Caregiver/Parent Consent letter

The researcher sent a consent form via the teacher to the caregivers/parents of identified participants (Appendix F). This letter requested consent for participation in the study and spelled out the researcher's expectations. It also explained that participation in the study was voluntary and that participants may withdraw at any point. It also guaranteed that data would be treated confidentially and be stored safely at the University of Pretoria for 15 years.

3.4.2.1.5 Participant Assent letter

The researcher requested assent by means of a Participant Assent Letter (Appendix G). This letter stated that participation was voluntary and emphasised that the participant could withdraw from the study at any point. Pictures were used in this letter to ensure that the participant had visual support to comprehend the information given. The researcher also requested the potential participants' permission to video record the interaction and asked them if they had any questions.

3.4.2.1.6 Non-disclosure agreement – Facilitator

The facilitator was given a non-disclosure agreement letter to sign before facilitating. This letter explained what the study entailed, the purpose of the study and the role of the facilitator (Appendix H).

3.4.2.1.7 Non-disclosure agreement – Independent Observer

The non-disclosure form was attached to the information letter and given to the independent observer. This letter included information on the role of the independent observer in the study and their agreement to not disclose any information that they observed (Appendix I).

3.4.3 Questionnaires

The following four questionnaires were used:

3.4.3.1 Biographical questionnaire to caregiver/parent

The biographical questionnaire (Appendix J) was given to caregivers/parents to obtain information about the participant. All the question responses were used for the participant description criteria in Table 8. The researcher assured the caregiver/parent that the information would be kept confidential and returned to the school in a sealed envelope.

3.4.3.2 Questionnaire to teacher

The researcher asked the participants' teachers to complete a questionnaire (Appendix K) that included questions to describe the participant (see Table 8). The questionnaire included questions about the child's ability to follow directives in class, their language abilities, matching and imitation skills, as well as attention skills.

3.4.3.3 Pilot study questionnaire

A questionnaire was devised for the caregiver/parent of the participant (Appendix L). The questions that were included related to the caregivers'/parents' understanding of consent letters. It also covered some procedural questions.

3.4.3.4 Questionnaire for research assistant in pilot study

A questionnaire was devised to be completed by the research assistant (Appendix M). This questionnaire included questions on the process and analysis procedures that were followed in the pilot study and were intended to improve the main study.

3.4.4 Standardised measures

Two standardised measures were used in this study:

3.4.4.1 The Childhood Autism Rating Scale (CARS)

The CARS (Schopler, Reichler, & Renner, 1988) is a well-established standardised screening tool that rates behaviour from non-autistic to mild, moderate and severe ASD *(*Appendix N*).*

3.4.4.2 Peabody Picture Vocabulary Test – 4 (PPVT-4)

The PPVT-4 (Dunn & Dunn, 1997) is a standardised test that is used to quantify the receptive vocabulary skills of the participants by examining vocabulary and auditory comprehension skills. It is used as a receptive vocabulary test (Appendix O).

3.4.5 Checklists

The following two checklists were used:

3.4.5.1 Procedural Integrity Script

The researcher used a procedural integrity script (Appendix P) for the trial as well as the directives task to ensure that sessions were all conducted in the manner required for each condition. Each session adhered to the same format to ensure uniformity.

3.4.5.2 Record Form

The record form (Appendix Q) was used to record the responses to the pre-test tasks and the directives task. Coding by means of symbols was done to indicate whether a response in the response column was correct (=) or incorrect (-).

3.4.6 Pre-test tasks

Three pre-test tasks were set for the participant to complete:

3.4.6.1 Noun Knowledge Task

Eight miniature toy objects (truck, teddy bear, doll, spoon, cap, car, bowl and box) were used to determine receptive noun knowledge. The participant was shown three objects that were randomly pre-assigned and they were asked: 'Give me the __ ___ _' along with an expectant gesture (holding out hands to receive the object). They were required to hand over the correct object. Each noun was assessed. To qualify for the experimental task, the participant was required to hand over a minimum of five correct items (Appendix R).

3.4.6.2 Preposition Knowledge Task

A teddy bear and a toy tuck were used to confirm each participant's preposition knowledge. The participant was asked to follow a directive, using the carrier phrase: 'Put the_____ (in front of, under, on, next to and behind) the truck.' The participant was required to correctly manipulate the toys in front of them based on the directive. To qualify for the experimental task, each participant required less than two correct directives (out of 5); this was to avoid an established knowledge of prepositions (Appendix R).

3.4.6.3 Matching Skills Task

Six miniature toy objects (doll, spoon, cap, car, bowl and box) were used to match to graphic pictures that were presented to the participant on an Apple iPad Air 2® with an iAdapter®. To qualify for the experimental task, the participant was required to match four or more items to their pictures correctly (Appendix R).

3.4.7 Experimental task: directives task

The materials required in this study included the directives, which had been prepared using two conditions:

i. With a dosage of 20% aided input

ii. With a dosage of 60% aided input

Each directive contained the carrier phrase ‘put the…’ followed by one of the objects (doll, spoon, cap, car, bowl and box) and a preposition (under, on, next to and behind). The directives were all 6/7 syllables in length. Table 4 below describes the conditions as well as the directives. The directives were summarised, adjusted and taken from those used in the study by Schlosser et al. (2013). Trial directives were added to ensure the participant was sure of what to do with the objects. If the participant failed to respond to the first trial, hand-over-hand assistance was used to explain the task. The directives were administered using a crossover design (using condition 1 and 2).

Table 4

Directives, assignment of conditions and the acquisition age for the prepositions

Condition	Assignment of conditions	Number	Directive	Accurate responses	Total
Trial		T1	Put the doll IN* the box	-	
		T2	Put the spoon in front of the CAR*	-	
		T3	Put the DOLL* IN FRONT OF* the BOX*	-	
		T4	Put the CAP* IN* the BOWL*	-	
1-2	*1, 4, 6. 7,*	1	Put the spoon ON* the bowl	4	46
	8, 9, 10,	2	Put the cap UNDER* the bowl	9	
	12, 14, 15,	3	Put the doll BEHIND* the bowl	8	
	18, 19, 20	4	Put the spoon NEXT TO* the bowl	7	
		5	Put the doll ON* the car	12	
		6	Put the cap NEXT TO* the box	6	
2-1	*2, 3, 5,*	1	Put the CAP* ON* the BOX*	10	54
	11. 13, 16,	2	Put the DOLL* UNDER* the BOX*	6	
	17, 21	3	Put the SPOON* BEHIND* the BOWL*	12	
		4	Put the DOLL* NEXT TO* the CAR*	7	
		5	Put the SPOON* UNDER* the CAR*	10	
		6	Put the CAP* BEHIND* the CAR*	9	

Note: Aided input in CAPS

*Chronological age in months at which typically developing children comprehend the preposition within the sentence, Owens (2008).

3.4.2.7.1 Toy objects for use in directives task

Toy objects were compiled for the study to be used for each directive. The objects, which were chosen and adapted based on the study conducted by Schlosser et al. (2013), included a doll, spoon, cap, car, bowl and box (Appendix S). These were presented in a digital form on an Apple iPad Air 2® with an iAdapter® and were presented using the Go Talk NOW application.

3.4.2.7.2 Aided symbols (PCS) for use in directives task

Aided symbols (PCS) were used in the directives. PCS is the most widely used aided graphic symbol set in the world (Beukelman & Mirenda, 2005). The symbols were used to supplement the directives by pointing to the graphic symbol simultaneously while speaking. The PCS were presented on an Apple iPad Air 2®

3.4.2.7.3 Go Talk NOW application.

This is an application that was used to present the symbols in colour on a white background within the application. One cell per a slide was used (Appendix T).

3.4.2.7 Feedback brochure to caregiver/parent of participants

Microsoft PowerPoint was used to make a brochure that outlined the aims, methodology, results and implications of the study. The brochure was distributed to the parents and staff at the school to disseminate the findings of the study (Appendix Y)

3.5 Pilot study

3.5.1 Objectives

The purpose of a pilot study is to assess the feasibility and appropriateness of the instruments and data collection procedures that will be required in the main study. It serves as a pre-test to the main study and increases the likelihood of success of the main study (Van

Teijilingen & Hundley, 2002). It also contributes to a good study design and provides valuable insight to the researcher (Van Teijilingen & Hundley, 2002).

3.5.2 Participants

The school principal was contacted and informed of the criteria for participants. One participant was randomly selected to be used as the study subject of the pilot study. This participant had been diagnosed with ASD in 2016 and he met all the selection criteria of the main study. The participant was male,

3.5.3 Aims, materials, procedures, results and recommendations

Table 5 outlines the aims, outcomes and recommendations of the pilot study.

3.5.4 Summary of pilot study

The pilot study results in Table 6 were used to adjust the data collection procedures and highlight any changes required in the study. The pilot study identified procedural and material appropriateness, and helped to identify the areas that required modification. These included: to adjust the method of completing the CARS (Schopler, Reichler, & Renner, 1988; by including the teacher in the rating procedure), to adjust some of the toy objects to better resemble the symbols, to alter the positioning of the participant to improve visibility in recordings and to ensure each object can be clearly viewed in the recordings by placing the toy objects close to the camera

Table 5

Pilot study considerations

Aim	Materials	Procedure	Results	Recommendations
1. To evaluate the feasibility of the recruitment strategy and criteria for recruiting children with ASD.	a) Permission Letter to School b) Teacher Consent Letter	These letters were discussed with the schools to identify possible participants for the study that fit the criteria. The researcher informed the teachers on the recruitment process and discussed possible changes to the recruitment strategy.	The schools agreed on the criteria and recommended that the teachers meet to short list possible participants. The teachers attended a meeting where they were briefed on how to identify possible participants.	No changes were recommended.
2. To determine whether the information in the letters was understandable to the parent/caregivers and teachers.	a) Permission Letter to School b) Caregiver/Parent Consent Letter c) Teacher Consent Letter	The researcher discussed the letters with the pilot caregiver/parent and identified any changes that were required.	The letters were clear, easy to understand and jargon was limited.	No changes were recommended.
3. To identify whether the biographical questionnaire to the caregiver/parent was understandable to the caregiver/parent.	a) Biographical questionnaire to Caregiver/Parent	The researcher verbally discussed the questionnaire and asked whether anything was unclear?	There were no concerns with the biographical questionnaire. The caregiver/parent found the questions and layout user-friendly and understandable.	No changes were made. The information obtained from the biographical questionnaire was sufficient to describe the participants.

	Aim	Materials	Procedure	Results	Recommendations
4.	To determine whether the questionnaire to the teacher was understandable to them.	a) Questionnaire to Teacher	The researcher verbally discussed the questionnaire, with the teachers, and asked whether anything was unclear?	There were no concerns with the questionnaire to the teacher.	No changes were made.
5.	To evaluate the appropriateness of assent procedures and if it required adjustments.	a) Participant Assent Letter	The researcher used the assent form to obtain assent before starting the pre-test task and the directives task. The researcher evaluated its appropriateness and the participants response. The researcher also asked the caregivers/parents of the participants to comment about it.	The participants understood and were able to provide assent. The caregiver/parent reported that the images helped them to understand the information given and that this assent procedure worked well with their child.	No changes were recommended.
6.	To determine the duration of time for the pre-test tasks.	a) Pre-test tasks b) CARS c) PPVT-4 d) Toy objects e) Photographs of directives	The researcher evaluated the results obtained from the pilot and identified whether the time was sufficient for the results to be recorded.	The following was identified. The pre-test tasks took twenty minutes which was voted as acceptable for the pilot. The PPVT-4 administration varied (according to the sets) and this required a motivational task to keep the participant motivated.	The following changes were made: A motivational task/game was required between the pre-test tasks and the PPVT-4. This was added into the procedure. It was decided that the CARS would be administered with assistance from the teachers (to limit the amount of time the pre-test task took) and this would not be included in the pre-test task.

	Aim	Materials	Procedure	Results	Recommendations
7.	To evaluate the appropriateness of the items used in the pre-test task and directive tasks.	a) PCS b) Toy objects c) Photographs of directives	The caregivers of the pilot participants were asked about the items used and if they appropriately represented the directives. The researcher focused on the tool and adjustments to ease its use.	There were no concerns highlighted. The caregiver/parent recognised the items as everyday items and found them easy to relate to. They provided suggestions about the cap.	The following changes were made: The cap was altered to remove the strap at the bottom.
8.	To determine if the record form for the pre-test task and directives task is appropriate for data capturing.	a) Procedural integrity script b) Record form c) Pre-test task appendices	The researcher asked the research assistant for possible changes on the record forms for improved user friendliness.	The research assistant provided feedback on the forms.	The following changes were made: The pre-test task activities were combined into one record form for a uniformed flow. The record form for the directive tasks was not altered.
9.	To confirm the time taken for the directive task to be administered.	a) Procedural integrity script b) Video recorder c) Test setting and positioning d) Record form e) Timer	The researcher confirmed the time taken to complete the task. The caregiver/parent was asked about how they found the duration of the directive task.	The time for the directive task was a maximum of twenty minutes. The caregiver/parent reported that the duration of the directive task was acceptable.	No changes were made.
10.	To evaluate the effectiveness of the checklist used to ensure procedural integrity.	a) Procedural integrity script b) Video recordings	The research assistant was asked to comment on the procedural integrity script.	The research assistant suggested some changes to the procedural integrity script format.	The changes were made: to include a tick box for official.

Aim	Materials	Procedure	Results	Recommendations
11. To determine if the positioning of the video recorder was appropriate to capture participants responses for the pre-test task and directive task in order to measure procedural integrity.	a) Recording equipment b) Test setting c) Questionnaire for research assistant on pilot study	The researcher asked the research assistant for any changes to improve setting, positioning, task administration and procedure based on the pilot study results.	The research assistant suggested moving the recording equipment closer to the participant to make it easier to see the toy objects. The research assistant also suggested lifting the PPVT-4 manual and not keeping it flat on the table as the responses were not always clear.	The recording equipment will be angled to focus on the toy objects. A stand will be used to prop the PPVT-4 manual up (so it can be seen clearly on the recordings).
12. To ensure the procedural integrity script is effective for evaluating the procedural integrity during the experimental task.	a) Procedural integrity script	The research assistant was asked to comment on the effectiveness of the procedural integrity script.	The researcher reported that the procedural integrity script worked well.	No changes were recommended.
13. To ensure the video recording device is capturing audible and visually clear recordings for use in evaluating procedural integrity.	a) Recording equipment b) Test setting and positioning c) Questionnaire for research assistant on pilot study d) Procedural integrity script	The researcher asked the research assistant to identify any changes required to improve device performance for the experimental task recordings.	The research assistant identified that the recordings were audible and clear. The recording equipment was suitable to be able to measure procedural integrity but the items were sometimes obscured with the participants hands.	The following suggestions were made: The researcher was asked to place all the items in front of the participant in clear view of the camera.

3.6 Main study

3.6.1 Recruitment and sampling

After ethical clearance (Appendix A) and GDE clearance (Appendix B) had been granted, a purposive sampling strategy was used to locate schools. Schools were identified based on their accessibility to children with ASD and their use of English as a medium of instruction. Once permission had been obtained from the principals of the schools concerned (Appendix C), a letter explaining the study was handed to the therapy unit (Appendix D) and the teachers (Appendix E) within the schools' ASD units, inviting them to assist in identifying suitable participants. The participants had to meet the participant selection criteria in Table 6.

The teachers assisted by sending out the caregiver/parent consent letters (Appendix F) and biographical questionnaires (Appendix J) for completion. At one school, 20 consent letters were initially given out, followed by an additional 15 via teachers, which totalled 35. Altogether 17 consent letters were returned, 16 provided consent and one did not provide consent, which represents a 49% response rate. At another school, 40 consent letters were sent out via the teachers. Altogether 22 consent letters were returned. 20 provided consent and 2 did not provide consent which represents a 58% response rate. Assent was provided by all of the participants.

A screening was conducted on all the participants for whom consent and assent was given, but only 21 were confirmed as participants as they met the selection criteria. Seventeen had to be excluded as they did not pass the screening process and three participants were absent. Hence a total of 21 participated in the study.

3.6.2 Participant selection criteria

The participant selection criteria are presented in Table 6.

Table 6
Participant selection criteria

Criterion	Justification	Measure used
Diagnosis of ASD by a medical professional such as a: neurodevelopmental paediatrician or neurologist	It is noted that children with ASD benefit from aided input (and there is a need to further evaluate effective strategies to improve communication skills with children with ASD. (Sennott et al., 2016).	Biographical questionnaire School acceptance letter
Functional hearing and vision	Participants need to be able to see the stimuli and hear the instructions given as this is the manner in which the task will be conducted in order to qualify as candidates (Schlosser et al., 2013).	Biographical questionnaire
Noun Knowledge	Participants need to be able to recognise the items used in the tasks as a prerequisite to completing the experimental task in this study. A minimum score of 5 or more was required on this task. (Schlosser et al., 2013).	Pre-test task
Preposition Knowledge	Participants need to be able to identify prepositions as a prerequisite to completing the experimental task in this study (Schlosser et al., 2013). Participants need to be able to identify a maximum of 2 prepositions on this task.	Pre-test task
Matching skills	Children need to have matching and imitation skills as a prerequisite to completing the experimental task in this study. Participants need to be able to match a minimum of 4 items in this task. (Schlosser et al., 2013).	Pre-test task Questionnaire to Teacher
Age range (5:00 to 11:11)	According to Owens (2008), the chronological age at which typically developing children comprehend the prepositions within the sentence is 48 months; at this age children older than 48 months with a language delay would have acquired these prepositions (Schlosser et al., 2013).	Biographical questionnaire
Exposure to English for at least 2 years at home or at school	The intervention will be conducted in English thus English exposure and understanding is essential.	Biographical questionnaire

3.6.3 Participant descriptions

The participants comprised of 21 children with ASD – 19 males and 2 females which is illustrated in Figure 2.

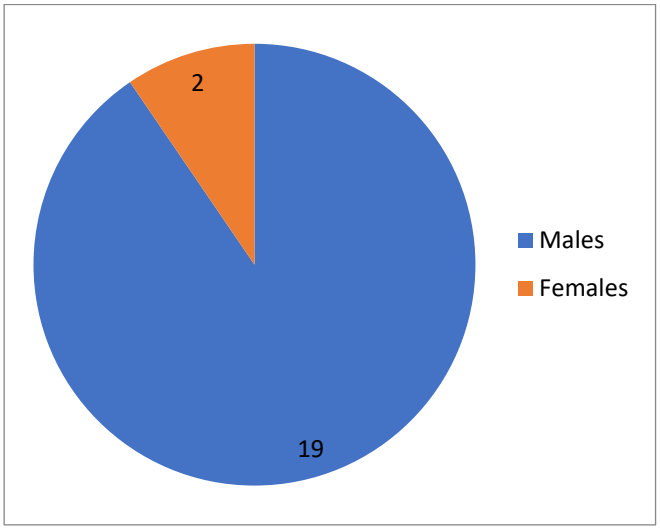

Figure 2. Pie graph illustrating gender.

Figure 3 illustrates the ages ranges of participants from 5.1 to 11.10 years (M=9.83). All the participants were diagnosed with ASD. The number of years post diagnosis ranged from 0 to 11. A total of 14 participants had previously been exposed to speech therapy.

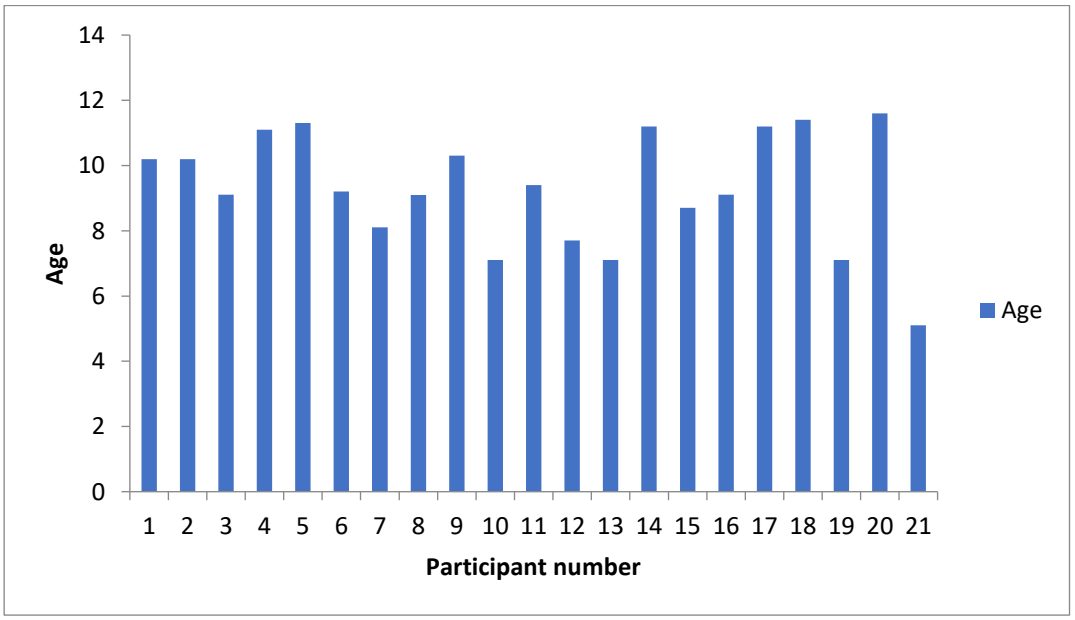

Figure 3. Graph depicting the age of participants.

The participants were further described based on their Childhood Autism Rating Scale (CARS) scores. which ranged from 30 to 45. Additionally, they were scored based on their Peabody Picture Vocabulary Test – 4 (PPVT-4) results, which ranged from 4 to 102, with age-equivalent scores ranging from <2 years to 6.3 years. In Table 8, the participants are summarised and described in terms of gender, language exposure, age of acquisition and previous exposure to intervention.

Although all the participants were found to have been exposed to English in their home and school environment, a few of them had also been exposed to other languages such as Setswana (n=5), Sepedi (n=2), Sesotho (n=2), isiZulu (n=2), Shona (n=1) Venda (n=1) and isiXhosa (n=2). 34% of participants had been exposed to English only (n=7), 52% of participants had been exposed to one additional language (n=11), whereas 14% of participants had been exposed to two additional languages (n=3).

Table 7 below provides a description of the participants.

Table 7
Main study participant descriptions

Participant number	Diagnosis	Gender	Diagnosis year	Time in school (in years)	Age in years	Home language	Total languages	Exposure to speech therapy	Vision	Hearing	Noun knowledge	Preposition knowledge	Matching skills	PPVT-4 Raw Score	Age equivalent	CARS classification	CARS score
											Out of 8	Out of 5	Out of 6				
1	ASD	Male	2011	5	10.2	Venda	2	Yes	Functional	Functional	8	2	6	38	2.1	Moderate ASD	36.5
2	ASD	Male	2011	3	10.2	English	1	Yes	Functional	Functional	5	1	6	10	<2	Moderate ASD	39.5
3	ASD	Male	2013	3	9.11	isiXhosa/Zulu	3	Yes	Functional	Functional	7	2	5	27	2.4	Moderate ASD	40
4	ASD	Male	2008	5	11.10	English	1	Yes	Functional	Functional	8	2	6	35	2.8	Moderate ASD	45
5	ASD	Male	2012	6	11.3	Setswana	2	Yes	Functional	Functional	7	1	6	26	2.4	Moderate ASD	43.5
6	ASD	Male	2013	1	9.2	Setswana	2	Yes	Functional	Functional	7	0	6	4	<2	Moderate ASD	41.5
7	ASD	Male	2015	1	8.11	isiZulu	2	No	Functional	Functional	7	2	6	32	2.7	Moderate ASD	39.5
8	ASD	Male	2014	3	9.1	Sepedi/Sesotho	3	Yes	Functional	Functional	7	1	6	28	2.5	Moderate ASD	43.5
9	ASD	Male	2018	2	10.3	Shona	2	No	Functional	Functional	5	2	6	21	2.1	Mild ASD	36
10	ASD	Female	2018	0.5	7.10	Sepedi	2	Yes	Functional	Functional	5	1	6	19	2.0	Moderate ASD	41
11	ASD	Female	2013	3	9.4	Setswana	2	Yes	Functional	Functional	8	0	6	34	2.8	Moderate ASD	37.5
12	ASD	Male	2016	1	7.7	English	1	No	Functional	Functional	8	1	6	29	2.5	Moderate ASD	43.5
13	ASD	Male	2018	0	7.10	English	1	No	Functional	Functional	7	2	6	64	4.0	Moderate ASD	44
14	ASD	Male	2013	2	11.2	Setswana	2	Yes	Functional	Functional	8	2	6	32	2.7	Moderate ASD	38
15	ASD	Male	2014	2	8.7	Zulu/Sesotho	3	Yes	Functional	Functional	8	2	6	30	2.6	Mild ASD	32
16	ASD	Male	2014	4	9.11	English	1	No	Functional	Functional	8	1	6	26	2.4	Moderate ASD	40
17	ASD	Male	2014	4	11.2	isiZulu	2	Yes	Functional	Functional	8	2	6	102	6.3	Mild ASD	30
18	ASD	Male	2013	5	11.4	Setswana	2	Yes	Functional	Functional	8	2	6	48	3.4	Moderate ASD	37.5
19	ASD	Male	2017	1	7.10	English	1	No	Functional	Functional	8	1	6	44	3.2	Mild ASD	33
20	ASD	Male	2017	2	11.6	isiXhosa	2	No	Functional	Functional	7	2	6	34	2.8	Moderate ASD	37
21	ASD	Male	2018	0.5	5.10	English	1	Yes	Functional	Functional	6	1	6	22	2.2	Mild ASD	33.5

3.7 Procedures

3.7.1 Ethical issues

The researcher obtained ethical clearance from the Research Ethics Committee (Appendix A) of the Faculty of Humanities at the University of Pretoria. Ethics are considered as beliefs about what is right or wrong, proper or improper, or good or bad (McMillan & Schumacher, 2001). The ethical considerations in McMillan and Schumacher (2010), as well as the Declaration of Helsinki (WHO, 2001), were used to guide the study principles. The researcher took great care to ensure that respect, beneficence, non-maleficence, autonomy and justice were maintained during the study.

Each participating caregiver/parent agreed to be part of the study by signing the informed consent letter. They were also aware that their child's participation was voluntary and that they had the right to withdraw from the study at any point. Participants involved in any type of medical research need to be informed about the nature of the study and they have the right to withdraw at any stage – with no penalties or contra-indications (WHO, 2001). In medical research, informed consent from a legally authorised representative is essential when a participant is legally, medically or physically incompetent to provide their own consent (WHO, 2001). Assent was obtained from each participant prior to the task and a special participant assent letter was used to ensure they understand. The letter contained no identifying information and each participant was allocated a number; thus, their details were kept strictly confidential. The researcher asked permission to video record the process, but these recordings never showed the faces of the participants in order to maintain their privacy and respect their integrity (WHO, 2001).

The researcher reacted with the same response to incorrect and correct responses to avoid the potentially negative emotional impact of low performance. The researcher furthermore inflicted no harm on the participants and acted in their best interest at all times.

Beneficence is emphasised in the ethical principles of research involving human subjects (WHO, 2001).

In the current study, respect involved maintaining privacy, withholding personal information, and promoting the needs of vulnerable populations (WHO, 2001). No identifying information was released about the schools or the participants, and the information provided was kept confidential. On completion of the study, the data collected was stored in a locked cupboard at the CAAC where it will be kept for a period of fifteen years and thereafter destroyed. The data was anonymised and presented in a mini-thesis, scientific article and lay article. The information gathered from the study was also presented to the participants in a user-friendly pamphlet.

3.7.2 General procedures

Following ethical clearance (Appendix A) from the Faculty of Humanities, written clearance from GDE (Appendix B) and consent from the chosen schools in Gauteng (Appendix C), the participants were contacted and consent forms were sent home (Appendix F) together with a biographical questionnaire (Appendix J).

3.7.3 Data collection procedures

A date and time were arranged for the researcher to go into the school to collect the consent forms and completed biographical questionnaires. The caregivers/parents were notified that data collection from the participant would take place at the school premises in the speech therapy room, where a desk and two chairs would be provided.

Once consent had been received, the researcher introduced herself and explained the procedures that would be followed in the study:

i. Obtaining consent and biographical information.

ii. Completing an additional questionnaire with the participant's teacher (Appendix K).

iii. Completing the pre-test task on one pre-arranged day.

iv. Completing the directives task on another pre-arranged day.

3.7.3.1 Assent

On a pre-arranged day, the researcher obtained assent from the participant by using the participant assent letter (Appendix G). This assent procedure was conducted twice – on the day of the pre-test task, as well as on the day of the directives task (before starting the tasks)

3.7.3.2 Screening: The pre-test task

The researcher conducted a noun knowledge task, a preposition task and a matching task. A break was introduced using a game to ensure that the participants were able to attend to the tasks. Thereafter, the researcher completed the PPVT-4 (Dunn & Dunn, 1997). Games were used for reinforcement in between the tasks, and it took approximately thirty minutes to complete. Each participant received a token of appreciation for having participated.

3.7.3.3 Experiment: The directives task

On a second pre-arranged day, the directives task was conducted. Each participant was seen one on one in a room at the school. Four trials were done initially which required the participant to follow what was asked by manipulating the toy objects based on the directive (e.g., *Put the doll *IN the car*). The directives task was then implemented with each participant individually. For each directive, the researcher placed two toy objects on the table in front of the participant. The researcher then pointed to the PCS on the iPad, while simultaneously speaking the directive. The researcher used PCS presented on an Apple iPad Air 2® with an iAdapter® in vertical orientation. For the 20% condition, aided input in the form of PCS was given for 20% of the directive *(e.g., Put the doll *ON the car, the word ON was aided)*. In the 60% condition, aided input in the form of PCS was given for 60% of the directive *(e.g., Put the *CAP *ON the *BOX, the words CAP, ON and BOX were aided)*.

Non-specific verbal praise was given after each directive. The participant was required to position the object relative to the preposition, within 10 seconds. If the participant used any other position for the object, the response was scored as incorrect on the Record Form (Appendix Q). If the participant failed to respond in time, the directive was repeated and scored according to the methods described (Schlosser et al., 2013). A correct response was when the object was placed in the spoken location. An incorrect response was recorded as any location other than what had been described. This task was completed in 20 minutes.

3.8 Reliability

Reliability is the degree of consistency measured and the extent to which results are consistent over time (Joppe, 2000).

3.8.1 Procedural integrity

A procedural integrity script was used when conducting the experimental directive task (i.e., a method to help reduce the discrepancies across participants) (Schlosser, 2002). Procedural reliability was evaluated by an independent observer – a medical professional – who evaluated the procedure and ensured that it was executed as described in the procedural integrity script (Appendix P). The observer used tick boxes to evaluate 100% of the responses and provide feedback. The following formula was used (McMillan & Schumacher, 2010):

$$\frac{steps\ correctly\ completed}{total\ number\ of\ steps} \times 100 = procedural\ integrity$$

$$\frac{1470}{1460} \times 100 = 99.3\%$$

The results indicated that the procedural reliability was high.

3.8.2 Data collection reliability

Data from the biographical questionnaire, pre-test task and experimental task was tabulated on a Microsoft Excel spreadsheet. An independent inter-rater was given access to all the response forms and a spreadsheet. This person was asked to compare all the responses, which were subsequently used to evaluate the percentage agreement. The following formula was used (McMillan & Schumacher, 2010):

$$\frac{number\ of\ agreements}{total\ number\ of\ agreements + disagreements} \times 100 = percentage\ agreement$$

$$\frac{900}{900 + 0} \times 100 = 100\%$$

The results indicated that the percentage agreement was 100%, which is considered excellent.

3.9 Data analysis

Descriptive statistics and multivariate analysis were used to analyse the data after it had been transferred to a Microsoft Excel spreadsheet. The methods that were used are highlighted in Table 9.

Table 8

Data analysis methods

Aims	Analysis	Justification
Description of participants biographical data, chronological age, accuracy of responses and PPVT-4 scores.	Tables and Bar graphs	Biographical data was captured in a Microsoft Excel spreadsheet. All the scores were compared and described using descriptive statistics (McMillan & Schumacher, 2010).
The effect of 20% aided input (Condition 1) on the accuracy of responses to directives containing prepositions.	Tables and Bar graphs	Accuracy of responses were captured in a Microsoft Excel spreadsheet. All the scores were compared and described using descriptive statistics (McMillan & Schumacher, 2010).
The effect of 60% aided input (Condition 2) on the accuracy of responses to directives containing prepositions.	Tables and Bar graphs	Accuracy of responses were captured in a Microsoft Excel spreadsheet. All the scores were compared and described using descriptive statistics (McMillan & Schumacher, 2010)
The carryover effect (Condition1-2 versus 2-1).	Mann-Whitney test (also known as the Wilcoxon signed-rank test),	Carryover effects were analysed to statistically measure the effects from the order of presentation (Senn et al., 2004).
Comparison on the effects of varied dosage of aided input (Condition 1 and 2) on following directives, containing prepositions, in children with ASD.	Descriptive statistics (Tables and Bar graphs) Sign test	The Sign test was chosen as it is a common statistical method that allows for one to compare groups by finding the scientifically significant changes in the group population statistics specifically their mean. When data is not normally distributed and the symmetry of the distribution cannot be assumed, this test is used (Conover, 1980).

4. Results

The results are presented in terms of the aims of the study. The data was captured on an Excel spreadsheet. Descriptive statistics were used to describe the data, and multivariate analysis was used to analyse the data. Firstly, the effects of varied dosage of aided input (Condition 1 and 2) are discussed, with a comparison on following directives that contain prepositions in children with ASD. Secondly, the accuracy of responses across Condition 1 and Condition 2 are compared and analysed using the accuracy of responses as the dependant measure. Finally, the individual directives and acquisition of prepositions are presented. Figure 4 below illustrates the participant responses in Condition 1 and 2.

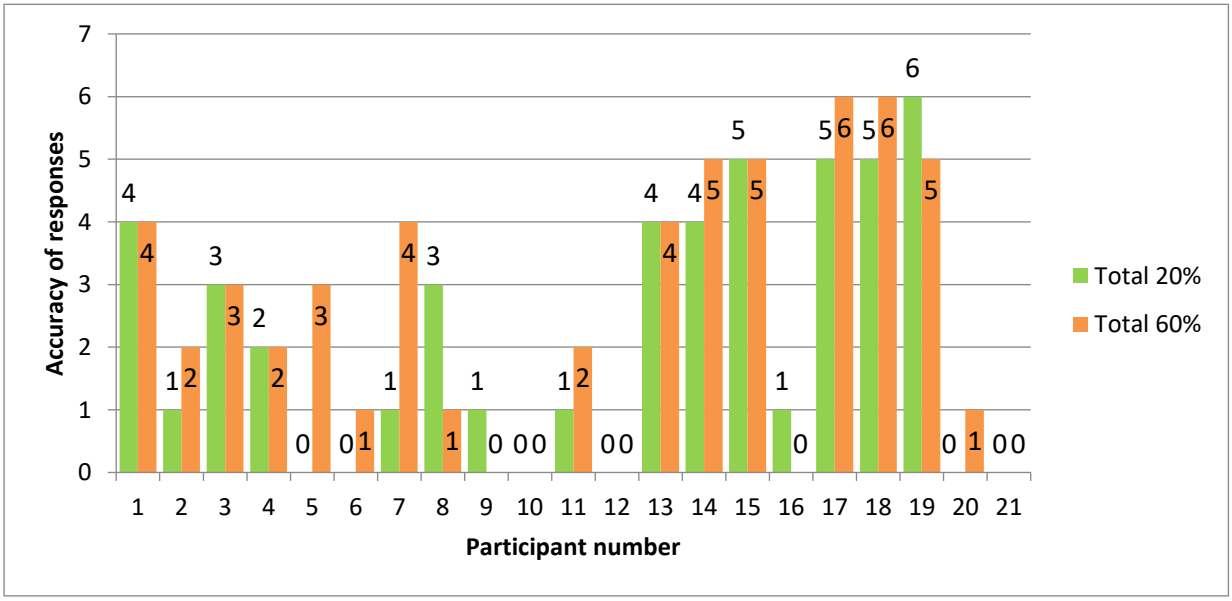

Figure 4. Accuracy of responses across Condition 1 (20%) and Condition 2 (60%).

4.1 Accuracy of responses to directives in Condition 1 and 2

In Condition 1, participants obtained an average response accuracy of 36.51%. The range of accurate responses was from 0 to 6 (*M*=2.19; *SD*=2.06). In Condition 2, participants obtained an average response accuracy of 42.86%. Their response score ranged from 0 to 6 (*M*=2.57; *SD*=2.11) (Illustrated in Figure 4).

In condition 1, 12 participants (2, 4, 5, 6, 7, 9, 10, 11, 12, 16, 20, 21) had accuracy scores below the mean, whereas nine participants (1, 3, 8, 13, 14, 15, 17, 18, 19) had accuracy scores above the mean. Participant 19 had 6/6 (the highest number of) accurate responses, whereas participants 5, 6, 10, 12, 20 and 21 had the lowest number of accurate responses for Condition 1 – they all scored 0/6. According to the CARS classification (Schopler, Reichler, & Renner, 1988), participant 19 had Mild ASD and he scored the fourth highest raw score for the PPVT-4, which was converted to an age equivalent of 3.2 years. Participant 19 was also considered in the high-performance category in the pre-tasks as a strong participant. He was exposed only to English in his home/school environment and had no history of speech and language intervention. Participants who had accuracy scores below the mean were classified in the low-performance category in the pre-tasks, except for participant 12 who was classified in the high-performance category.

In condition 2, 11 participants (2, 4, 6, 8, 9, 10, 11, 12, 16, 20 and 21) had accuracy scores below the mean, whereas ten participants (1, 3, 5, 7, 13, 14, 15, 17, 18 and 19) had accuracy scores above the mean. Participants 17 and 18, who both scored 6/6 accurate responses, had the highest number of accurate responses, whereas participants 9, 10, 12, 16 and 21 had the least accurate responses for Condition 2 – they all scored 0/6. Participant 17 had the highest raw score on the PPVT-4 and participant 18 had the third highest raw score on the PPVT-4. Participant 17 was classified with Mild ASD according to the CARS (Schopler, Reichler, & Renner, 1988), with a known history of speech and language

intervention, and participant 18 was classified as Moderately Autistic according to the CARS, also with a known history of speech and language intervention. Both participants 17 and 18 were placed in the high-performance category in the pre-tasks.

4.2. Comparison between each aided input level (Condition 1 and 2)

A total of 21 participants were involved in this study. Figure 5 below illustrates the aided input results. Four participants (8, 9, 16 and 19) had higher scores for Condition 1, whereas nine participants (2, 5, 6, 7, 11, 14, 17, 18, 20) had higher scores for Condition 2. Five participants (1, 3, 4, 13, 15) had the same response score across both conditions (1 and 2) and three (participants 10, 12 and 21) did not respond to condition 1 or 2 (scored 0/6 for both conditions).

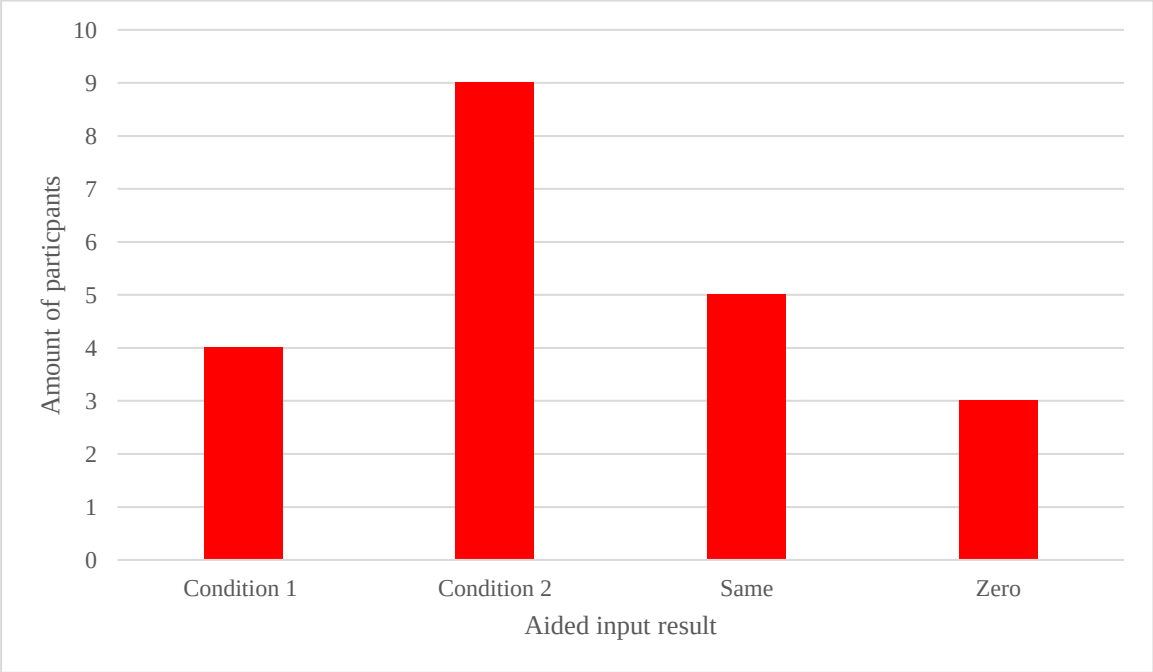

Figure 5. Distribution of results across each condition.

4.2.1 Descriptive statistics

The combined average response accuracy for all the directives was 39.68% across both Condition 1 and Condition 2 (*M*=2.38, *SD*=2.07). Figure 6 below illustrates the means for both Condition 1 (*M=2.1, SD=2.06*) and Condition 2 (*M=2.57, SD=2.11*).

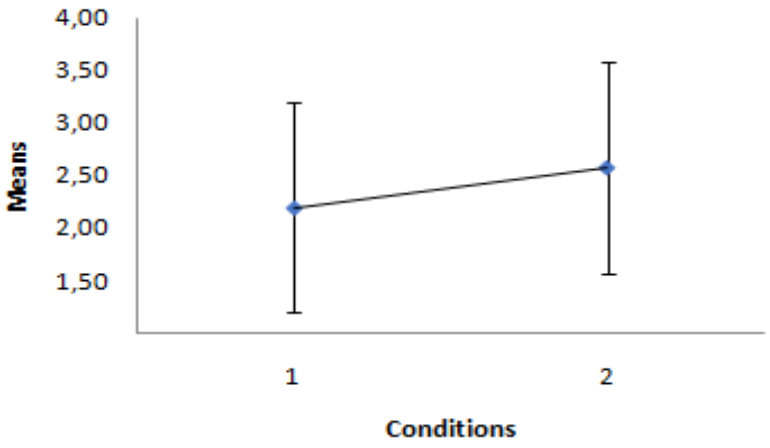

Figure 6. Means for Condition 1 and Condition 2.

4.2.2 Statistical analysis of levels

In order to determine whether the data distribution was normal, the Shapiro-Wilk test of normality was used (as opposed to the Kolmogorov-Smirnov test), seeing that the sample size was below 50 (Guo, 2012; Zimmerman, 2003). The results suggest that the data was not normally distributed, either for condition 1 (*W= .86, p=.008*) or for condition 2 (*W= .90, p=.039*).

As the assumption of normality had been violated, the non-parametric alternative to the repeated measures of ANOVA was used, that is, the Sign test. The Sign test is used when the data is not normally distributed and the symmetry of the distribution cannot be assumed (Conover, 1980; Pallant, 2016).

Non-parametric tests interpret the median, compared to parametric tests that interpret the mean. The sign test indicated that there was no evidence to suggest a statistical difference between the medians for condition 1 (*Mdn=1*) and condition 2 (*Mdn=2*) (Z=*, p=.267) at the 5% level of significance. As the sample size was below 30, the exact sign test was used and the *Z statistic could not be computed with this sample size.

The Mann-Whitney test (also known as the Wilcoxon signed-rank test), was used to determine the carryover effects. The Mann-Whitney test was selected as the 2-way ANOVA could not be used, given the non-normality of the data as indicated above. A difference in scores was calculated between participants who had been introduced to Condition 1 (Mdn=2) followed by Condition 2 (Mdn=2), compared to participants who had been introduced first to Condition 2, and then to Condition 1. This difference score was used to determine whether there were any carryover effects. The result was that there were no such effects (U = 32.5, p = 0.165), that is, there was no difference in scores for participants – whether they received Condition 1 (mean rank = 9.5) or Condition 2 (mean rank = 13.4) first. The data conclusively suggested that the order of presentation of the directives did not influence the results. This test also concluded that there was no difference in the order of conditions presented to the participants for Condition 1-2 (*Mdn= 2, M=2.5, SD= 2.19*) and Condition 2-1 (*Mdn=2, M=2.19, SD= 1.91*).

Table 9 compares the participants' accuracy scores during Condition 1 and 2 with their CARS scores and PPVT-4 scores.

Table 9

Accuracy of responses in Condition 1 and Condition 2 with PPVT-4 scores and CARS scores

Participant Number	Accuracy of responses in Condition 1	Accuracy of responses in Condition 2	PPVT-4 raw score	PPVT-4 age equivalent	CARS scores	Classification
1	4	4	38	2.1	36.5	Moderate
2	1	2	10	<2	39.5	Moderate
3	3	3	27	2.4	40	Moderate
4	2	2	35	2.8	45	Moderate
5	0	3	26	2.4	43.5	Moderate
6	0	1	4	<2	41.5	Moderate
7	1	4	32	2.7	39.5	Moderate
8	3	1	28	2.5	43.5	Moderate
9	1	0	21	2.1	36	Mild
10	0	0	19	2.0	41	Moderate
11	1	2	34	2.8	37.5	Moderate
12	0	0	29	2.5	43.5	Moderate
13	4	4	64	4.0	44	Moderate
14	4	5	32	2.7	38	Moderate
15	5	5	30	2.6	32	Mild
16	1	0	26	2.4	40	Moderate
17	5	6	102	6.3	30	Mild
18	5	6	48	3.4	37.5	Moderate
19	6	5	44	3.2	33	Mild
20	0	1	34	2.8	37	Moderate
21	0	0	22	2.2	33.5	Mild

4.2.3 Analysis of individual directives and acquisition of prepositions

When the group data was captured, compared and analysed, it was noted that some participants (10, 12, 21) were unable to follow the directives – no matter what the condition. Figure 7 below illustrates the incorrect and correct responses for each directive. The total number of correct responses for Condition 1 was 46 and for Condition 2 it was 54.

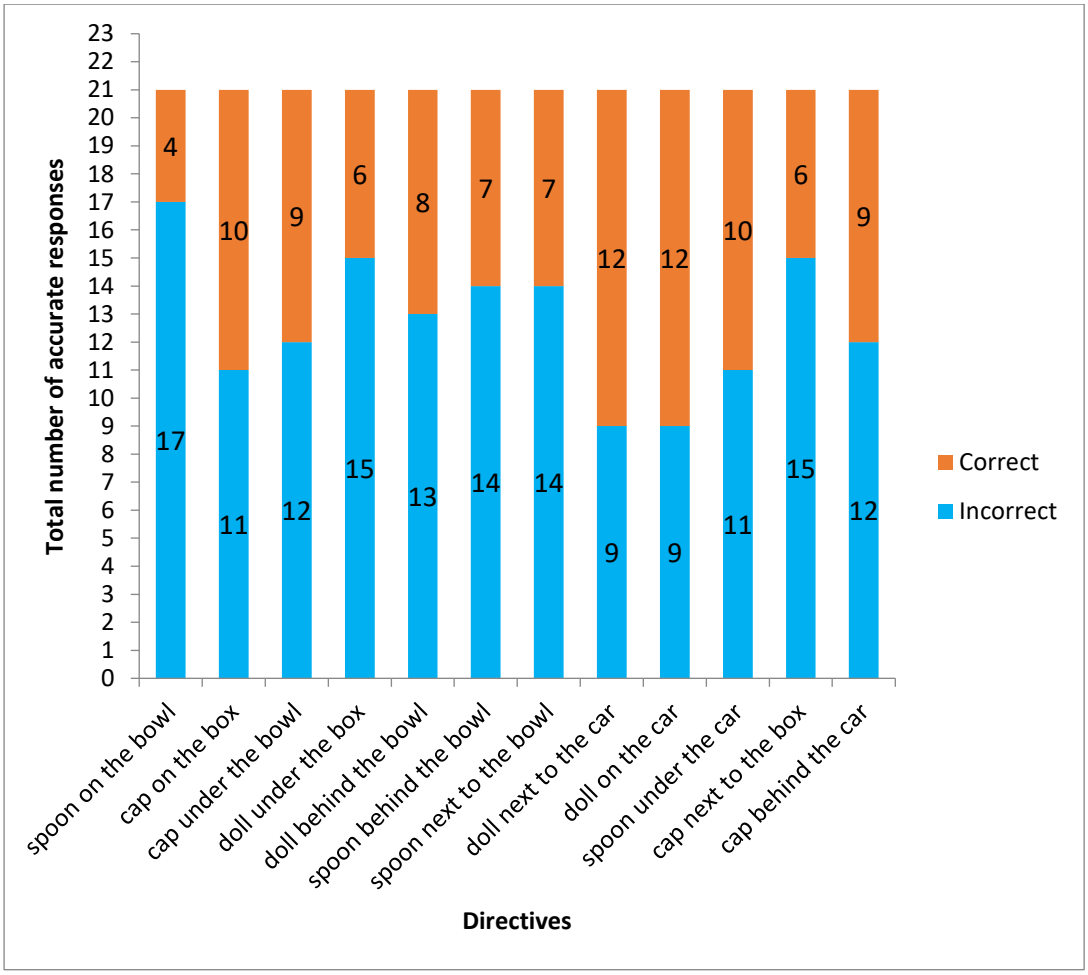

Figure 7. Combined accuracy of responses for both conditions for each directive.

Comparisons were made between the accuracy of the responses per directive in both conditions as well as the age of acquisition for prepositions (see Table 4). Some directives were answered more accurately than others. In Condition 1, the highest accurate responses were related to directive 5, which was *Put the doll on the car*. According to Owens (2008),

the preposition ‘on’ is acquired at the age of 24 months. In Condition 2, however, the highest accurate response was for directive 4, which was *Put the doll next to the car*. The preposition ‘next to’ is only acquired at the age of 40 months.

The least accurate response in Condition 1 was directive 1, which was *Put the spoon on the bowl.* Although the preposition ‘on’ is acquired at the age of 24 months (Owens, 2008), most of the responses were completed by the participant putting the spoon *in* the bowl. The least accurate response in Condition 2 was directive 2, which was *Put the doll under the box.* Most participants responded by putting the doll *in* the box. The preposition ‘under’ is usually acquired at 36 months (Owens, 2008). Since the results above match those found in Schlosser et al. (2013), the researcher concluded that the results were not influenced by the age of acquisition of the specific prepositions (Schlosser et al., 2013).

5. Discussion

The results of the present study are next discussed in terms of the sub-aims of the study. The discussion provides a comparison of Condition 1 and Condition 2 that was aimed at examining the dosage effects of aided input. The data collected contributes to addressing the research gap in understanding the effects that aided input have on the comprehension of a directive in children with ASD (Allen et al., 2017; Schlosser et al., 2013; Sennot et al., 2016).

5.1 Comparison between each aided input level (Condition 1 and 2)

In Condition 1 (20%), all the participants with accuracy scores below the mean had Moderate ASD according to the CARS classification, except for Participant 21. Also, these participants had all been exposed to one additional language as well as English in their home and school environment, except for participants 12 and 21, who had been exposed to English only. Those participants who achieved accuracy scores below the mean, had PPVT-4 score equivalents ranging from <2 to 2.8 years of age, whereas those with accuracy scores above the mean obtained PPVT-4 score equivalents ranging from 2.1 to 6.3 years of age.

In Condition 2 (60%), the participants with the lowest number of accurate responses had PPVT-4 raw scores ranging from 2.0-2.5 years of age. They also had CARS scores classifying them from Mild to Moderate ASD. The participants who achieved accuracy scores below the mean had PPVT-4 score equivalents ranging from <2 to 2.8 years of age, whereas those with accuracy scores above the mean had PPVT-4 score equivalents ranging from 2.1 to 6.3 years of age. Some of the participants who had no (0) accurate responses, had had no exposure to speech-language intervention (participants 9, 12, 16), while others had a history of speech-language intervention (participants 10 and 21). All the participants who had accuracy scores below the mean, scored in the low-performance category in the pre-test tasks, except for participants 12 and 16. These two participants had been exposed only to English in

their home and they knew no additional language. The current study examined not only the baseline receptive skills of the participants, but also classified the severity of ASD. Romski and Sevcik (1997) argue that it is important for persons with ASD to comprehend words in order to benefit from aided input thus this information was vital. Additionally, all the languages a child was exposed to at home were identified.

Schlosser et al. (2013) suggest that, when examining data, one should examine individual differences in the population when drawing conclusions about ASD populations as this helps to better explain the results., PPVT-4 scores and CARS classification scores help to formulate patterns in data by comparing these results.

Of all the participants, 14 had been exposed to speech-language intervention prior to the study. Of the four participants who achieved a high number of accurate responses in Condition 1, one had been exposed to speech-language intervention and three (participants 9, 16, 19) had not. Of the nine participants who scored a higher number of accurate responses in Condition 2, seven had a history of speech-language intervention (participant 2, 5, 6, 11, 14, 17, 18) and two not (participants 7 and 20). This might have contributed to their overall improved performance for Condition 2. Speech-language intervention using AAC exposure could well benefit participants who are exposed to graphic symbols versus those participants who had no previous exposure to graphic symbols (Romski & Sevcik, 1993). It is essential for children to have some background training on the use of AAC and exposure to symbols, as this helps with system familiarisation (Beukelman & Mirenda, 2005; Light & McNaughton, 2014). This is essential in analysing the results as the literature confirms that in order to use AAC, successful understanding and training is essential (Beukelman & Mirenda, 2005; Light & McNaughton, 2014).

Overall, the results of the study comparing both conditions show a higher accuracy of responses for Condition 2. Similar findings were obtained by Schlosser et al. (2013) who

reported improved accuracy of participants' responses to directives when paired with aided input. The studies examining directives in children with ASD (O'Brien et al., 2016; Remner et al., 2016; Schlosser et al., 2015) also reported similar findings. The order of directives was proved to be not statistically significant and it did not affect the results in the study – as was found also in the study by Schlosser et al. (2013). To minimise the carryover effects, order effects were effectively controlled in this study by ensuring that the conditions were tested a week apart. They were also counterbalanced across participants to prevent any carryover effects (Senn et al., 2004). (This is known as the washout period (Senn et al., 2004)).

6. Conclusion

In this study, an investigation was conducted into the effects of aided input in children with ASD. Participants were given 12 directives to follow and two conditions of aided input were applied. The number of accurate responses was calculated and compared based on the conditions. Following a summary of the main findings of this research, the clinical implications of the study are explored and recommendations are made for future research.

6.1 Summary of main findings

The study in hand has added to the information available on using aided input for children with ASD, in order to support their following of directives that contain prepositions. It was concluded in the results that some children with ASD (n=9) who received a higher level of aided input (60%) were able to respond more accurately than those who received a lower level of aided input (20%). However, there were some children (n=4) who responded better to a lower level of aided input (20%) than a higher level of aided input (60%). Some children responded in the same manner to the higher and lower levels of aided input (n=5). Others (n=3), did not respond to either. However, there was no statistically significant difference between the levels of aided input in this study. Lastly, no carryover effects were found between Conditions 1 and 2.

6.2 Clinical implications of the study

The main clinical implication of the current study is that varying the dosage of aided input may have an effect on how children with ASD follow directives that contain prepositions. The results confirmed that the accuracy of directives improved when spoken language was supported with aided input in some children with ASD. The 60% aided input condition yielded a higher accuracy of responses than the 20% aided input condition in some children with ASD (n=9). However, some children with ASD (n=4) responded better to the lower level of aided input (20%) than the higher level of aided input (60%). Some children

with ASD (n=5) responded in the same manner for both levels of aided input and some children with ASD did not respond at all (n=3). There was no statistically significant difference between the higher (60%) and lower (20%) level of aided input. The participants with higher comprehension scores and prior exposure to speech-language intervention achieved higher accuracy scores – a result that is congruent with the findings of the literature presented earlier. The results also suggested that there were no carryover effects between the two conditions of aided input. Finally, the results found should help us to expand on our knowledge about dosage variations and the effect on receptive language skills. It will also help to show the effects of aided input (using graphic symbols) in facilitating comprehension skills.

6.3 Evaluating the study

6.3.1 Strengths of the research

One of the strengths of this study is that it compared children without an established preposition knowledge, and it involved a pre-test task that increased the design strength and allowed the researcher to comment on pre-existing skills. It was also one of the first studies to include more than 20 participants, which helped to establish some patterns for the homogenous sample. Most similar studies have reported a smaller participant size. The study was strengthened by its chosen research design – a within-subject design. This was advantageous, as each participant was exposed to every condition and there were no significant carryover effects.

Furthermore, since data was collected in the same manner for all participants, the procedural integrity and reliability percentages were high, and this improved the study's rigour. It is also one of the few studies that have aimed to compare two conditions of aided input by varying the dosage of input. Furthermore, the directives used in this study were suitable, as they have been used in peer-reviewed studies before.

6.3.2 Limitations of the research

It should be highlighted that the researcher was not blind to the randomisation process, which is a limitation to the design. In this study toy objects were used; however, there were some unusual size relations (i.e., the girl could not fit inside the car), which could be considered a limitation, as it may have a negative influence on the comprehension skills of the participant. Furthermore, in the directives task, the participant's full comprehension of the directive was not assessed (each child was presented with the toys in front of them). The directives contained unconventional pairings such as: 'put the girl under the box', which could have had an impact on overall accuracy, as it is not the most ecologically valid directive.

6.4 Recommendations for future research

Several recommendations for future studies have been suggested, based on the results of this study. The study should perhaps be replicated as a comparison study on the effects of aided input using another developmental condition such as cerebral palsy, Down's syndrome or developmental delay. It is recommended that a third condition of comparison, perhaps a condition with no aided input, could be investigated in order to isolate the effects of aided input. Another suggestion for future research is to investigate the use of realistic, digital photographs for aided input and compare them to PCS. Additionally, researchers may want to consider using a more demanding task to compare the accuracy of responses; participants may follow the directives without the researcher pre-selecting the toys and putting them in front of the participant. Further studies may include a larger number of directives to compare the overall effect of the aided input. Lastly, researchers may consider using new AAC input interfaces such as static, animated or dynamic scene cues to present the directives and compare the accuracy of responses.

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7. Appendices

Appendix A

Ethical Clearance

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Research Ethics Committee

30 October 2018

Dear Ms Hassim

Project:	**Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)**
Researcher:	**R Hassim**
Supervisor:	**Prof S Dada**
Department:	**Centre for Augmentative and Alternative Communication (CAAC)**
Reference number:	**18376216 (GW20181024HS)**

Thank you for the application that was submitted for ethical consideration

The resubmitted application was **approved** by the **Research Ethics Committee** on 25 October 2018. 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.

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: PGHumanities@up.ac.za

cc: Prof S Dada (Supervisor) Prof J Bomman (HoD)

Fakulteit Geesteswetenskappe
Lefapha la Bomotho

Research Ethics Committee Members: Prof MME Schoeman (Deputy Dean); Prof KL Harris; Mr A Bizos; Dr L Blokland; Dr K Booyens; Dr A-M de Beer; Ms A dos Santos; Dr R Fasselt; Ms KT Govinder Andrew; Dr E Johnson; Dr W Kelleher; Mr A Mohamed; Dr C Puttergill; Dr D Reyburn; Dr M Soer; Prof E Taljard; Prof V Thebe; Ms B Tsebe; Ms D Mokalapa

Appendix B

GDE Clearance

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	**10 December 2018**
Validity of Research Approval:	**04 February 2019 – 30 September 2019** **2018/366**
Name of Researcher:	**Hassim.R**
Address of Researcher:	**52 Dale brook Crescent**
	Victory Park
	Johannesburg, 2195
Telephone Number:	**072 137 8613**
Email address:	**rafeeyah.hassim2@gmail.com**
Research Topic:	**Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD).**
Type of qualification	**Masters**
Number and type of schools:	**Three LSEN Schools**
District/s/HO	**Johannesburg North and Tshwane South**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

10/12/2018

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

Making education a societal priority

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

1. *The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*
3. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*
4. *A letter / document that outline the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
5. *The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
6. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
7. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
8. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
9. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
10. *The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
11. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
12. *On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
13. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.*
14. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

.....

Mr Gumani Enos Mukatuni
Acting CES: Education Research and Knowledge Management

DATE: 10/12/2018

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
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Appendix C

Permission Letter to School Principal

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Permission Letter to School Principal

2019-01-01

Dear School Principal

A request to conduct research at your school

Introduction:

My name is Rafeeyah Hassim. I am currently a master's student at the Centre for Augmentative and Alternative Communication (CAAC). In partial fulfilment, for degree purposes, I will be conducting a study entitled "Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)".

Aims of the study:

This study aims to determine the accuracy of responses to directives containing prepositions when given 2 different amounts of aided input. It will compare the results and the responses by highlighting the effect of dosage variations.

Rationale for the study:

Children with ASD sometimes have difficulty understanding auditory information. The information gathered from this study is important as there is a need to explore how children understand directives using a combination of visual and auditory input, called aided input. Aided input can be used to better understand children with ASD and their ability to respond to information presented with different amounts of aided input.

What can be expected from the school?

Once permission has been obtained, the school will be asked to assist with identifying potential students who meet the selection criteria namely: diagnosis of ASD by a neurodevelopmental paediatrician or neurologist, functional hearing and vision, students between the age of 6 and 8 with appropriate matching skills. The researcher will then speak to the teachers who will be asked to assist with the recruitment of participants. Thereafter, consent letters with attached questionnaires will be sent to the caregivers/parents of the children identified together with a questionnaire inviting them to voluntarily participate in the study, with the right to withdraw at any point. Only participants who have given assent and returned a consent letter may participate in this research study. After parental consent is provided, the teachers will be requested to fill out a questionnaire on the skills of the students in their class. It will be followed by a pre-assessment stage, where the researcher will assess the skills of the students using

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

formal language tests and this will take one hour. The researcher will then conduct the directives task which will take twenty minutes and will be video recorded for analysis. This will take place in the school speech therapy room which includes a desk and two chairs.

Data storage:

Upon completion of the study, the data collected in this study will be stored in a locked cupboard at the CAAC for a period of fifteen years. The data will be anonymized and presented in a mini thesis, scientific article and lay articles.

Participation is voluntary and there are no negative consequences to participation. Participants may withdraw from the study at any point in time and all data pertaining to them will be destroyed immediately. All data will be kept strictly confidential.

Should you require further information, you are welcome to contact me or my supervisor on the details below. Attached please find copies of the letters of consent for caregivers/parents, teachers and assent letters for the children.

I trust the information provided is sufficient and will enable you to to grant the researcher permission to conduct the proposed study at your school. Kindly complete the attached reply slip below as proof of permission being granted.

Yours faithfully

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

School Principal Reply slip

I, _____, Principal of _____ (School name), hereby grant the researcher permission for the research study.

Please tick below:

☐ I do consent to participate in the study

1) We have received and read the request as well as the information letter
2) We understand the requirements for the completion of the study
3) We hereby permit Rafeeyah Hassim to conduct the study in accordance with the requirements stipulated in the letter

OR

☐ I do not consent to participate in the study

_____ _____

Signature of school principal Signature of student researcher

Signed at _____ on _____ of _____ 201__

School stamp:

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Lefapha la Bomotho

Centre for Augmentative and Alternative Communication, Room 2-36, Com path Building, Lynnwood Road
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Appendix D

Therapy Unit Consent Letter

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Therapy Unit Reply slip

I, _____, Head of the Autism unit at _____ (School name), hereby grant the researcher permission for the research study.

Please tick below:

☐ I do consent to participate in the study

1) We have received and read the request as well as the information letter
2) We understand the requirements for the completion of the study
3) We hereby permit Rafeeyah Hassim to conduct the study in accordance with the requirements stipulated in the letter

OR

☐ I do not consent to participate in the study

_____
Signature of head of therapy unit

Signed at _____ on _____ of _____ 201__

School stamp:

Fakulteit Geesteswetenskappe
Lefapha la Bomotho

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Appendix E

Teacher Consent Letter

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Teacher Consent Letter

Dear Teacher

I wish to inform you that I have received permission to conduct my study at your institution. I would like to request your permission to assist in my study. Please see below for information on my study entitled: "Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)".

Aims of the study:

This study aims to determine the accuracy of responses to directives containing prepositions when given 2 different amounts of aided input. It will compare the results and the responses by highlighting the effect of dosage variations.

Rationale for the study:

Children with ASD sometimes have difficulty understanding auditory information. The information gathered from this study is important as there is a need to explore how children understand directives using a combination of visual and auditory input, called aided input. Aided input can be used to better understand children with ASD and their ability to respond to information presented with different amounts of aided input.

What can be expected from the school and teachers?

Once permission has been obtained from the bodies and the principal at the school, the researcher will speak to the teachers who will be asked to assist with the recruitment of participants. As teachers participating in this study you will be asked to help recruit students in your classes based on a selection criterion. The selection criteria includes: any student that has a diagnosis of ASD by a neurodevelopmental paediatrician or neurologist, functional hearing and vision, is between the age of 6 and 8 and is able to match items. Thereafter consent letters with attached questionnaires will be sent to the caregivers/parents of the children identified together with a questionnaire inviting them to voluntarily participate in the study, with the right to withdraw at any point. Only participants who have given assent and returned a consent letter may participate in this research study. After parental consent is provided, a short questionnaire will be given to you to fill out on the students participating in the study. All the information you provide will be strictly confidential and no identifying information will be released. Teachers will only be asked to fill out one questionnaire per a student once permission has been obtained.

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There are 2 stages in the study. The first assessment stage of the study will help to assess the skills of the students using formal language tests and this will take one hour where the students will be taken from their classrooms to the school speech therapy room. This will be conducted during school hours without interfering with academic time. On a separate day, the second task (using the directives) will be conducted; this will take twenty minutes and will be conducted on a pre-arranged date.

Data storage:

Upon completion of the study, the data collected in this study will be stored in a locked cupboard at the CAAC for a period of fifteen years. The data will be anonymized and presented in a mini thesis, scientific article and lay articles. All data will be kept confidential.

Should you require further information, you are welcome to contact me or my supervisor on the details below. I trust the information I have provided is sufficient and will enable you to voluntarily participate in this study. You have the right to withdraw at any point in time.

Yours faithfully

Teacher Reply slip

I, _____ (Full name and surname), Teacher at

_____ (School name), hereby stipulate the following:

Please tick below:

☐ I do consent to participate in the study

1) I have received and read the request as well as the information letter
2) I understand the requirements for the completion of the study and my role in the study
3) I hereby permit Rafeeyah Hassim to conduct the study in accordance with the requirements stipulated in the letter

OR

☐ I do not consent to participate in the study

_____ _____

Signature of school principal Signature of student researcher

Signed at _____ on _____ of _____ 201__

Appendix F

Caregiver/Parent Consent letter

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Caregiver/Parent Consent Letter

Dear Caregiver/Parent

My name is Rafeeyah Hassim. I am currently a masters student at the Centre for Augmentative and Alternative Communication (CAAC). In partial fulfillment, for degree purposes, I will be conducting a study entitled: "Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)". I would like to ask your permission for your child to participate in my study. This study is being conducted under the supervision of Professor Shakila Dada.

Aims of the study:

This study aims to determine the accuracy of responses to directives containing prepositions when given 2 different amounts of aided input. It will compare the results and the responses by highlighting the effect of dosage variations.

Rationale for the study:

Children with ASD sometimes have difficulty understanding auditory information. The information gathered from this study is important as there is a need to explore how children understand directives using a combination of visual and auditory input, called aided input. Aided input can be used to better understand children with ASD and their ability to respond to information presented with different amounts of aided input.

Expectations of you as a parent?

Your child has been identified as a possible participant in this study as they have a diagnosis of ASD by a neurodevelopmental paediatrician or neurologist, they have functional hearing and vision, they are between the age of 6 and 8 and they are able to match items. Please complete the reply slip below should you wish to provide consent for your child to participate in this study. If you have consented for your child to participate in the study, kindly complete the attached questionnaire to help the researcher with some information about your child.

What will be expected of my child?

There will be 2 stages in this study. The first assessment stage will help to identify your child's comprehension skills and this will involve the researcher conducting a standardized language test on

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

them by having them point to pictures when they are named; this will help to identify their understanding abilities. This task will take one hour. This will be conducted during school hours without interfering with academic time. On a separate day, the second assessment task (using the directives) will be conducted; this will take twenty minutes. Your child assent will be obtained on that day in terms of their willingness to participate in the study. They will be taken out of class for the specified period of time on this occasion and they will be given verbal instructions to follow i.e. to manipulate some toys in response to the directives provided. The task will be video recorded but these recordings will be kept confidential and no identifying information about you or your child will be present in the video recording. The video recordings of the study will only be watched by myself, my supervisors, and one independent rater. The video recordings of the study will only be used for data analysis and will not be used for further analysis for research purposes.

Data storage:

Upon completion of the study, the data collected in this study will be stored in a locked cupboard at the CAAC for a period of fifteen years. The data will be anonymized and presented in a mini thesis, scientific article and lay articles. Participation is voluntary and there are no negative consequences to participation. You may withdraw your child or your child may withdraw from the study at any point in time and all data pertaining to your child will be destroyed immediately. All data pertaining to your child will be kept strictly confidential.

Should you require further information, you are welcome to contact me or my supervisor on the details below. Kindly contact us on the details below.

Yours faithfully

Caregiver/Parent Reply slip

Name of Child: _____

Name of Caregiver/Parent: _____

Project title: **Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)**

[redacted]

☐ I, _____ (Name and

Surname) give consent for my child _____ (Full name, surname and class) to participate in the study entitled: **Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)** conducted by Rafeeyah Hassim under the supervision of Prof Shakila Dada.

My consent is voluntary and I understand that I may withdraw my child's participation from the study at any time. I understand that the data will stored for 15 years at the CAAC and that all data will be treated confidentially. I understand that the data maybe re-used for analysis. I understand that the sessions will be video-recorded for data collection purposes and may be used for training and conferences. I understand that all information used and obtained in this study will be treated as confidential.

OR

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

_____ _____

Signature of caregiver Date

Appendix G

Participant Assent Letter

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Participant Assent Letter

Hello, my name is Rafeeyah Hassim

**I want to ask you if you would like to work with me today.
If you say yes this is what we will do:**

First, I will show you some toys and ask you to point to some of them. Then, I will show you some pictures and ask you to point to the toy that is the same.

Then, I will give you some toys and tell you or show you pictures of where to put them. I will ask you to put them in different places.

I will videotape you as you do this.

If you want to stop at any time, I want you to please tell me or point to this picture of the stop sign and I will take you back to class.

Centre for Augmentative and Alternative Communication, Room 2-36, Com path Building, Lynnwood Road
University of Pretoria, Private Bag X20
Hatfield 0028, South Africa
Tel +27 (0)12 420 2001
Fax +27 (0) 86 5100841
Email saak@up.ac.za
www.caac.up.ac.za

Fakulteit Geesteswetenskappe
Lefapha la Bomotho

Appendix H

Non-disclosure agreement – Facilitator

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Non-disclosure form: Facilitator

Dear Facilitator

Thank you for agreeing to participate in this study.

Introduction:

My name is Rafeeyah Hassim. I am currently a master's student at the Centre for Augmentative and Alternative Communication (CAAC). In partial fulfillment, for degree purposes, I will be conducting a study entitled "Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)".

Aims of the study:

This study aims to determine the accuracy of responses to directives containing prepositions when children with ASD are given 2 different amounts of aided input (20% and 60%). It will compare the results and the responses by highlighting the effect of dosage variations.

Rationale for the study:

Children with ASD sometimes have difficulty understanding auditory information. The information gathered from this study is important as there is a need to explore how children learn using visual and auditory information. Aided input can be used to better understand children with ASD and their ability to respond to information presented with different amounts of aided input.

What will be expected of you?

You will be asked to accompany the participant (child) and to remain with the participant (child) in the therapy room during the tasks. You will not be required to explain or demonstrate anything. Everything that you see is confidential and as such may not be shared with any other person.

Please complete the attached reply slip. Should you require further information, you are welcome to contact me or my supervisor on the details below.

Yours faithfully

[redacted]

[redacted]

Facilitator Reply slip

Date: _____

Name of Facilitator: _____

Occupation: _____

Project title: **Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)**

[redacted]

I hereby stipulate that:

- ☐ I understand the scope of this study and the way in which it will be conducted.
- ☐ I understand my role in the study.
- ☐ I understand that I may not tell anyone, in writing or verbally, about any of the information regarding the study or the participants that I am made aware of during the study.

I hereby declare that I will not disclose any information regarding the study or the participants and will maintain confidentiality at all times.

Signed at _____ on the of _____ 201_.

Signature of Facilitator: _____

Appendix I

Non-disclosure agreement – Independent Observer

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Non-disclosure form: Independent Observer

Dear Independent Observer

Thank you for agreeing to participate in this study.

Introduction:

My name is Rafeeyah Hassim. I am currently a master's student at the Centre for Augmentative and Alternative Communication (CAAC). In partial fulfillment, for degree purposes, I will be conducting a study entitled "Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)".

Aims of the study:

This study aims to determine the accuracy of responses to directives containing prepositions when given to children with ASD using 2 different amounts of aided input (20% and 60%). It will compare the results and the responses by highlighting the effect of dosage variations.

Rationale for the study:

Children with ASD sometimes have difficulty understanding auditory information. The information gathered from this study is important as there is a need to explore how children learn using visual and auditory information. Aided input can be used to better understand children with ASD and their ability to respond to information presented with different amounts of aided input.

What will be expected of you?

You will be asked to observe video recordings of the tasks and to complete a checklist to determine that all of the tasks are completed, and in the correct order. You will also be asked to observe video recordings to ensure that the responses were captured correctly. All of the data that you observe is confidential and as such may not be shared with any other person.

Please complete the attached reply slip. Should you require further information, you are welcome to contact me or my supervisor on the details below.

Yours faithfully

[redacted]

[redacted]

Independent Observer Reply slip

Date: _____

Name of Independent Observer: _____

Occupation: _____

Project title: **Effects of varied dosage of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)**

[redacted]

I hereby stipulate that:

- ☐ I understand the scope of this study and the way in which it will be conducted.
- ☐ I understand my role in the study.
- ☐ I understand that I may not tell anyone, in writing or verbally, about any of the information regarding the study or the participants that I am made aware of during the study.

I hereby declare that I will not disclose any information regarding the study or the participants and will maintain confidentiality at all times.

Signed at _____ on the of _____ 201_.

Signature of Independent Observer: _____

Appendix J

Biographical questionnaire to Caregiver/Parent

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Biographical Questionnaire to Caregiver/Parent

Dear Parent/Caregiver

Thank you for agreeing to participate. Please fill in the questions below regarding your child;

Biographic information

Student Name	
Class	
Gender	
Date of Birth	
Total years in this school	

Diagnosis

What was your child's diagnosis? _____ When was your child diagnosed? _____

Who confirmed the diagnosis? _____

Do you have any supporting letter or documentation? _____ (please attach)

Please tick the column (Yes) or (No):

	YES	NO
Hearing and Vision		
Does your child have any visual concerns or do they wear glasses?		
Have you had your child's hearing assessed?		
Does your child wear a hearing aid?		
Does your child respond when you call him/her?		
Language		
Does your child use English in your home?		
Does your child understand English?		

Fakulteit Geesteswetenskappe
Lefapha la Bomotho

Appendix K

Questionnaire to teacher

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

Official use:
Participant _

Questionnaire to Teacher

Dear Teacher

Thank you for consenting to participate in the study. I would like to ask you to please fill in this questionnaire on the following student: _____.

Student name	
DOB	
Class	
How long has the student been in this school?	
How long has the student been in your class?	

1. **Following instructions** (please ✓ and comment)

   Can the student:

   ☐ listen to an instruction without interrupting

   ☐ understand basic instructions

   ☐ follow one-part instructions

   ☐ follow two-part instructions

   ☐ follow multiple part instructions

Comment:

_____

_____

Centre for Augmentative and Alternative
Communication, Room 2-36, Com path
Building, Lynnwood Road
University of Pretoria, Private Bag X20
Hatfield 0028, South Africa
Tel +27 (0)12 420 2001
Fax +27 (0) 86 5100841
Email saak@up.ac.za
wwwcaac.up.ac.za

2. **Motor abilities** (please ✓ and comment)
Can the student:

☐ Open and close a lunch box independently

☐ Hold a glass to drink water independently

☐ Point to objects that they want

Comment:

_____

3. **Cognitive abilities** (please ✓ and comment)

Can the student:

☐ Match items that are the same

☐ Identify objects by pointing to them

☐ Concentrate on a task for 15 minutes

☐ Imitate actions

☐ Match shapes

☐ Match colours

☐ Make choices when given 4 items (Pick one)

Comment:

_____

4. Comment on the student's attention span?

_____

_____

5. Comment on the student's listening skills?

_____

_____

If you have any further information you would like to add please write it below.

_____

_____

Thanking you for taking your time to complete this form.

Rafeeyah Hassim

Appendix L

Pilot study Questionnaire

Thank you for your willingness to be a pilot for the main study.

Please answer the following questions:

1. Is there anything on the information letter that can be improved? Do you have any changes to suggest?

_____

_____

2. How understandable were the questions in the biographical questionnaire? Was everything clear to you?

_____

_____

3. How did you find the screening procedure length and the amount of time taken?

_____

_____

4. How appropriate did you find the vocabulary and the items that were used?

_____

_____

5. How appropriate did you find the visuals and pictures?

_____

_____

6. Do you have any further suggestions?

_____

_____

Date: _____

Name: _____

Signature: _____

Appendix M

Questionnaire for research assistant on pilot

Please answer the following questions:

1. Were there here anything on the information letter that can be improved? Do you have any changes to suggest?

_____

_____

2. How understandable were the questions in the biographical questionnaire? Was everything clear to you?

_____

_____

3. Do you have any further suggestions?

_____

_____

Date: _____

Name: _____

Signature: _____

Appendix N

The Childhood Autism Rating Scale (CARS)

C · A · R · S

The Childhood Autism Rating Scale

Eric Shopler, Ph. D., Robert J. Reichler, M.D.,
and Barbara Rochen Renner, Ph. D.

Published by:
WESTERN PSYCHOLOGICAL SERVICES
Publishers and Distributors
12031 Wilshire Boulevard
Los Angeles California 90025-1251

Name: _____ Sex: _____

ID Number: _____

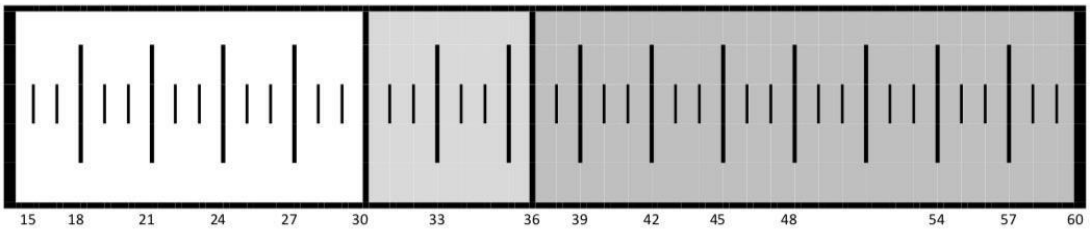
Test Date: Year _____ Month _____ Day _____

Birth Date: Year _____ Month _____ Day_____

Chronological Age: Years _____ Months _____

Rater:_____

Category Rating Scores															
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	Total Score



CARS Rating Sheet

Directions: For each category, use the space provided below each scale for taking notes concerning the behaviours relevant to each scale. After you have finished observing the child, rate the behaviours relevant to each scale. For each item, circle the number which corresponds to the statement that best describes the child. You may indicate the child is between two descriptions by using half ratings of 1.5, 2.5, or 3.5. Abbreviated rating criteria are presented for each scale. See chapter 2 of the Manual for detailed rating criteria.

	I. RELATING TO PEOPLE
1	Evidence of difficulty/abnormality in relating to people ▪ The child's behaviour is appropriate for his/her age. Some shyness, fussiness or annoyance at being told what to may be observed, but not to an atypical degree.
1.5	
2	Slightly abnormal relationships ▪ The child may avoid looking the adult in the eye. Avoid the adult or become fussy if interaction is forced, be excessively shy, not be as sensitive to the adult as its typical, or cling to parents somewhat more than most children of the same age.
2.5	
3	Moderately abnormal relationships ▪ The child shows aloofness (seems unaware of adults) at times. Persistent and forceful attempts are necessary to get the child's attention at times. Minimal contact is initiated by the child.
3.5	
4	Severely abnormal relationships ▪ The child is consistently aloof or unaware of anything the adult is doing. He/she almost never responds or initiates contact with the adult. Only the most persistent attempts to get the child's attention have any effect.

Observations:

	III. EMOTIONAL RESPONSE
1	Age-appropriate and situation-appropriate emotional responses ▪ The child shows the appropriate type and degree of emotional response as indicated by a change in facial expression, posture and manner.
1.5	
2	Mildly abnormal emotional responses ▪ The child occasionally displays what inappropriate type and/or degree of emotional response. Reactions are somewhat unrelated to the objects or events surrounding them.
2.5	
3	Moderately abnormal emotional responses ▪ The child shows definite signs of inappropriate type and/or degree of emotional response. Reactions may be quite inhibited or excessive and unrelated to the situation; may grimace, laugh, or become rigid even though no apparent emotion-producing objects or events are present.
3.5	
4	Severely abnormal emotional responses ▪ Responses are seldom appropriate to the situation, once the child gets in a certain mood, it is very difficult to change the mood. Conversely, the child may show wildly different emotions when nothing has changed.

Observations:

	II. IMITATION
1	Appropriate imitation ▪ The child can imitate sounds, words, and movements which are appropriate for his/her skill level.
1.5	
2	Mildly abnormal imitation ▪ The child imitates simple behaviours such as clapping or single verbal sounds most of the time; occasionally, imitates only after prodding or after a delay.
2.5	
3	Moderately abnormal imitation ▪ The child imitates only part of the time and requires a great deal of persistent and help from the adult; frequently imitates only after a delay.
3.5	
4	Severely abnormal imitation ▪ The child rarely or never imitates sounds, words or movements even with prodding and assistance from the adult.

Observations:

	IV. BODY USE
1	Age-appropriate body use ▪ The child moves with the same ease, agility, and coordination of a normal child of the same age.
1.5	
2	Mildly abnormal body use ▪ Some minor peculiarities may be present, such as clumsiness, repetitive movements, poor coordination, or the rare appearance of unusual movements.
2.5	
3	Moderately abnormal body use ▪ Behaviours that are clearly strange or unusual for a child of his age may include strange finger movements, peculiar finger or body turning, staring or picking at the body, self-directed aggression, rocking, spinning, wiggling or toe-walking.
3.5	
4	Severely abnormal body use ▪ Intense or frequent movements of the types listed above are signs of severely abnormal body use. These behaviours may persist despite attempts to discourage them or involve the child in other activities.

Observations:

	V. OBJECT USE
1	Appropriate use of, and interest in toys and other objects ▪ The child shows normal interest in toys and other objects appropriately for his/her skill level and uses these toys in an appropriate manner.
1.5	
2	Mildly inappropriate interest in, or use of, toys and other objects ▪ The child may show atypical interest in a toy or play with it in an inappropriately childish way (e.g. banging or sucking on the toy).
2.5	
3	Moderately inappropriate interest in, or use of, toys and other objects ▪ The child may show little interest in toys or other objects, or may be preoccupied with using an object or toy in some strange way. He/she may focus on some insignificant part of a toy, become fascinated with light reflecting off the object, repetitively move some part of the object, or play with one object exclusively.
3.5	
4	Severely inappropriate interest in, or use of, toys and other objects ▪ The child may engage in the same behaviours as above, with greater frequency and intensity. The child is difficult to distract when engaged in these inappropriate activities.
Observations:	

	VIII. LISTENING RESPONSE
1	Age-appropriate listening response ▪ The child's visual behaviour is normal and appropriate for that age. Vision is used together with other senses as a way to explore a new object.
1.5	
2	Mildly abnormal visual response ▪ The child must be occasionally reminded to look at objects. The child may be more interested in looking at mirrors or lighting than peers, may occasionally stare off into space, or may also avoid looking people in the eye.
2.5	
3	Moderately abnormal visual response ▪ The child must be reminded frequently to look at what he/she is doing. He/she may stare into space, avoid looking people in the eye, look at objects from an unusual angle, or hold objects very close to their eyes.
3.5	
4	Severely abnormal visual response ▪ The child consistently avoids looking at people or certain objects and may show extreme forms of other visual peculiarities described above.
Observations:	

	VI. ADAPTATION TO CHANGE
1	Age-appropriate response to change ▪ While the child may notice or comment on changes in routine, he/she accepts these changes without undue distress.
1.5	
2	Mildly abnormal adaptation to change ▪ When an adult tries to change tasks the child may continue the same activity or use the same materials.
2.5	
3	Moderately abnormal adaptation to change ▪ The child actively resists changes in routine, tries to continue the old activity, and is difficult to distract. He/she may become angry and unhappy when an established routine is altered.
3.5	
4	Severely abnormal adaptation to change ▪ The child shows severe reactions to change. If a change is forced, he/she may become extremely angry or uncooperative and respond with tantrums.
Observations:	

	IX. TASTE, SMELL, AND TOUCH RESPONSE AND
1	Normal use of, and response to, taste, smell and touch ▪ The child explores new objects in an age appropriate manner, generally by feeling and looking. Taste or smell may be used when appropriate.. When reacting to minor, everyday pain, the child express discomfort but does not overreact.
1.5	
2	Mildly abnormal use of, and responses to, taste, smell and touch ▪ The child may persist in putting objects in his or her mouth may smell or taste inedible objects may ignore or overreact to mild pain that a normal child would express as discomfort.
2.5	
3	Moderately abnormal use of, and response to, taste, smell, and touch ▪ The child may be moderately preoccupied with touching, smelling, or tasting object or people.. The child may either react too much or too little.
3.5	
4	Severely abnormal use of, and response to, taste, smell and touch ▪ The child is preoccupied with smelling, tasting, or feeling objects more for the sensation than normal exploration or use the objects.. The child may completely ignore pain or react very strongly to slight discomfort.
Observations:	

	VII. VISUAL RESPONSE
1	Age-appropriate visual response ▪ The child's visual behaviour is normal and appropriate for that age. Vision is used together with other senses as a way to explore a new object.
1.5	
2	Mildly abnormal visual response ▪ The child must be occasionally reminded to look at objects. The child may be more interested in looking at mirrors or lighting than peers, may occasionally stare off into space, or may also avoid looking people in the eye.
2.5	
3	Moderately abnormal visual response ▪ The child must be reminded frequently to look at what he/she is doing. He/she may stare into space, avoid looking people in the eye, look at objects from an unusual angle, or hold objects very close to their eyes.
3.5	
4	Severely abnormal visual response ▪ The child consistently avoids looking at people or certain objects and may show extreme forms of other visual peculiarities described above.
Observations:	

	X. FEAR OR NERVOUSNESS
1	Normal fear or nervousness ▪ The child's behaviour is appropriate both to the .... And to his or her age.
1.5	
2	Mildly abnormal fear or nervousness ▪ The child occasionally shows too much or too little fear or nervousness compared to the reaction of a normal child of the same age in a similar situation.
2.5	
3	Moderately abnormal fear or nervousness ▪ The child shows either quite a bit more or a bit less fear than is typical even for a younger child in a similar situation.
3.5	
4	Severely abnormal fear or nervousness ▪ Fears persist even after repeated experience with harmless evens or objects. It is extremely difficult to calm or comfort the child. The child may, conversely, fail to show appropriate regard for hazards with other children of the same age avoid.
Observations:	

	XI. VERBAL COMMUNICATION
1	Normal verbal communication, age and situation appropriate.
1.5	
2	Mildly abnormal verbal communication ▪ Speech shows overall retardation. Most speech is meaningful however, some echolalia or pronoun reversal may occur. Some peculiar words or jargon may be used occasionally.
2.5	
3	Moderately abnormal verbal communication ▪ Speech may be absent. When present, verbal communication may be a mixture of some meaningful speech and some peculiar speech such as jargon, echolalia, or pronoun reversal. Peculiarities in meaningful speech include excessive questioning or preoccupation with particular topics.
3.5	
4	Severely abnormal verbal communication ▪ Meaningful speech is not used. The child may make infantile squeals, weird or animal-like sounds, complex noises approximating speech, or may show persistent, bizarre use of some recognisable words or phrases.
Observations:	

	XIII. ACTIVITY LEVEL
1	Normal activity level for age and circumstances ▪ The child is neither more active nor less active than a normal child of the same age in a similar situation.
1.5	
2	Mildly abnormal activity level ▪ The child may be mildly restless or somewhat "lazy" and slow moving at times. The child's activity level interferes only slightly with his or her performance.
2.5	
3	Moderately abnormal activity level ▪ The child may be quite active and difficult to restrain. He or she may have boundless energy and may not go to sleep readily at night. Conversely, the child may be quite lethargic and need a great deal of prodding to get him or her to move about.
3.5	
4	Severely abnormal activity level ▪ The child exhibits extremes of activity or lethargy and may even shift from one extreme to the other.
Observations:	

	XI. NONVERBAL COMMUNICATION
1	Normal use of nonverbal communication, age and situation appropriate
1.5	
2	Mildly abnormal use of nonverbal communication ▪ Immature use of nonverbal communications may only point vaguely, or reach for what he or she wants, in ... where same age child may point or gesture more specifically to indicate what he or she wants.
2.5	
3	Moderately abnormal use of nonverbal communication ▪ The child is generally able to express needs or desires nonverbally, and cannot understand the nonverbal communication of others.
3.5	
4	Severely abnormal use of nonverbal communication ▪ The child only uses ... or peculiar gestures which have no apparent meaning, and show no awareness of meanings associated with the gestures of facial expressions of others.
Observations:	

	XIII. LEVEL AND CONSISTENCY OF INTELLECTUAL
1	Intelligence is normal and reasonably consistent across various areas ▪
1.5	
2	Mildly abnormal intellectual functioning ▪ The child is not as smart as typical children of the same age: skills appear fairly evenly retarded across all areas.
2.5	
3	Moderately abnormal intellectual functioning ▪ In general, the child is not as smart as typical children of the same age, however, the child may function nearly normally in one or more intellectual areas.
3.5	
4	Severely abnormal intellectual functioning ▪ While the child generally is not as smart as the typical child of his age, he or she may function even better than the normal child of the same age in one or more areas.
Observations:	

	XV. GENERAL IMPRESSIONS
1	No autism ▪ The child shows none of the symptoms characteristic of autism.
1.5	
2	Mild autism ▪ The child shows only a few symptoms or only a mild degree of autism.
2.5	
3	Moderate autism ▪ The child shows a number of symptoms or a moderate degree of autism.
3.5	
4	Severe autism ▪ The child shows many symptoms or an extreme degree of autism.
Observations:	

Appendix O

Peabody Picture Vocabulary Test – 4

PPVT™-4

Peabody Picture Vocabulary Test, Fourth Edition

Lloyd M. Dunn, PhD
Douglas M. Dunn, PhD

FORM A

Name: _____ Sex: ☐F ☐M ID #: _____

Address: _____ Current Grade: _____ Test Date ____ ____ ____
or Level of
City: _____ Education Completed: _____ Birth Date ____ ____ ____

State: _____ ZIP: _____ School/Agency: _____ Age* ____ ____
*Do not round up.

Home Phone: _____ Teacher/Counselor: _____

Language Spoken at Home: _____ Examiner: _____

Reason for Testing: _____

NORMS USED: ☐ Age ☐ Grade: Fall ☐ Grade: Spring

Graphical Profile

	0.1%	2.2%	13.6%	34.1%	34.1%	13.6%	2.2%	0.1%
	−5SD	−4SD	−3SD	−2SD	−1SD	Avg.	+1SD	+2SD	+3SD	+4SD
Standard Score	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
Percentile	1	2	5	9	16	25	37	50	63	75	84	91	95	98	99
NCE	1	10	20	30	40	50	60	70	80	90	99
Stanine	1	2	3	4	5	6	7	8	9
Description	Extremely Low Score	Moderately Low Score	Low Average Score	High Average Score	Moderately High Score	Extremely High Score

Score Summary

RAW SCORE (From box on page 2) ____

Standard Score (Table B.1, B.2, or B.3) ____

Confidence Interval (Table B.1, B.2, or B.3) ☐90% ☐95% ____ - ____

Percentile (Table B.4) ____

Normal Curve Equivalent (NCE) (Table B.4) ____

Stanine (Table B.4) ____

Growth Scale Value (GSV) (Table B.5 or B.6) ____

☐ Age Equivalent (Table B.5) ____

☐ Grade Equivalent (Table B.6) ____

Recommendations:

Administering Items

The **Training Items** must be administered first. Directions are listed on the training easel pages.

The **Start Item** is the first item in the age-appropriate item set. Start Items are listed in the right-hand column on this page, and on the tabbed easel pages.

The **Complete Set Rule** requires the administration of all 12 items in the set in order, beginning with the first item in the set.

The **Basal Set Rule** is one (1) or zero (0) errors in a set. Establish the Basal Set first. If necessary, administer earlier sets until the rule is met or until Set 1 is completed. Then test forward by sets until a Ceiling Set is obtained.

The **Ceiling Set Rule** is eight (8) or more errors in a set. Stop testing after giving ***all*** items in the Ceiling Set.

Recording Responses and Errors

- Record the examinee's response (1, 2, 3, or 4) on the record form by circling the corresponding number after the stimulus word for each item. The correct response is in red. See the example below.
- Indicate an error (incorrect or no response) by drawing an oblique line through the *E*, as shown below.

Example:

Start Ages 2:6–3:11					SET 1
1. ball	1	2	(3)	4	E
2. dog	(1)	2	3	4	E
3. spoon	1	2	3	(4)	E
4. foot	1	2	(3)	4	E

For each set, record the number of errors in the box labeled "Number of Errors."

Calculating the Total Number of Errors

Transfer the number of errors per set to the boxes below, and add up the total errors. Be sure to use the *lowest* Basal Set and the *highest* Ceiling Set. See Chapter 2 of the manual for further details.

Set 1 ____	Set 2 ____	Set 3 ____
Set 4 ____	Set 5 ____	Set 6 ____
Set 7 ____	Set 8 ____	Set 9 ____
Set 10 ____	Set 11 ____	Set 12 ____
Set 13 ____	Set 14 ____	Set 15 ____
Set 16 ____		
Set 17 ____	Set 18 ____	Set 19 ____

Total Errors (between Basal Set and Ceiling Set) ____

Calculating the Raw Score

Record the number of the Ceiling Item, which is the last item in the Ceiling Set. For example, if the examinee's *highest* Ceiling Set was Set 6, the Ceiling Item would be 72. Subtract from the Ceiling Item the total number of errors made by the examinee (from the Basal Set through the Ceiling Set). The result is the Raw Score. See Chapter 2 of the manual for further details.

Ceiling Item ____

Total Errors – ____

Raw Score ____

Transfer this Raw Score to the record form cover.

Start Your Administration Here

Training Items

All instructions for introducing the test and administering the Training Items are located in the easel.

Ages 2:6 Through 3:11

Training Page A

A1. boy	1	2	3	4	E
A2. chair	1	2	3	4	E
A3. puppy	1	2	3	4	E
A4. bike	1	2	3	4	E

After the examinee responds correctly and without help to two Training Items, go to Item 1, and begin testing.

Age	2:6–3:11
Start Item	1

Ages 4 Through Adult

Training Page B

B1. laughing	1	2	3	4	E
B2. sleeping	1	2	3	4	E
B3. hugging	1	2	3	4	E
B4. walking	1	2	3	4	E

After the examinee responds correctly and without help to two Training Items, go to the appropriate Start Item, and begin testing.

Age	4	5	6	7	8	9	10
Start Item	13	37	49	61	73	85	97

Age	11–12	13	14–16	17–18	19+
Start Item	109	121	133	145	157

- **Complete Set Rule:** Administer all 12 items in the set in order, starting with the first item in the set.
- **Basal Set Rule:** One (1) or zero (0) errors in a set.
- **Ceiling Set Rule:** Eight (8) or more errors in a set.

▼ Start Ages 2:6–3:11					SET 1
1. ball	1	2	3	4	E
2. dog	1	2	3	4	E
3. spoon	1	2	3	4	E
4. foot	1	2	3	4	E
5. duck	1	2	3	4	E
6. banana	1	2	3	4	E
7. shoe	1	2	3	4	E
8. cup	1	2	3	4	E
9. eating	1	2	3	4	E
10. bus	1	2	3	4	E
11. flower	1	2	3	4	E
12. mouth	1	2	3	4	E
Number of Errors					

▼ Start Age 4					SET 2
13. pencil	1	2	3	4	E
14. cookie	1	2	3	4	E
15. drum	1	2	3	4	E
16. turtle	1	2	3	4	E
17. red	1	2	3	4	E
18. jumping	1	2	3	4	E
19. carrot	1	2	3	4	E
20. reading	1	2	3	4	E
21. toe	1	2	3	4	E
22. belt	1	2	3	4	E
23. fly	1	2	3	4	E
24. painting	1	2	3	4	E
Number of Errors					

					SET 3
25. dancing	1	2	3	4	E
26. whistle	1	2	3	4	E
27. kicking	1	2	3	4	E
28. lamp	1	2	3	4	E
29. square	1	2	3	4	E
30. fence	1	2	3	4	E
31. empty	1	2	3	4	E
32. happy	1	2	3	4	E
33. fire	1	2	3	4	E
34. castle	1	2	3	4	E
35. squirrel	1	2	3	4	E
36. throwing	1	2	3	4	E
Number of Errors					

▼ Start Age 5					SET 4
37. farm	1	2	3	4	E
38. penguin	1	2	3	4	E
39. gift	1	2	3	4	E
40. feather	1	2	3	4	E
41. cobweb	1	2	3	4	E
42. elbow	1	2	3	4	E
43. juggling	1	2	3	4	E
44. fountain	1	2	3	4	E
45. net	1	2	3	4	E
46. shoulder	1	2	3	4	E
47. dressing	1	2	3	4	E
48. roof	1	2	3	4	E
Number of Errors					

▼ Start Age 6					SET 5
49. peeking	1	2	3	4	E
50. ruler	1	2	3	4	E
51. tunnel	1	2	3	4	E
52. branch	1	2	3	4	E
53. envelope	1	2	3	4	E
54. diamond	1	2	3	4	E
55. calendar	1	2	3	4	E
56. buckle	1	2	3	4	E
57. sawing	1	2	3	4	E
58. panda	1	2	3	4	E
59. vest	1	2	3	4	E
60. arrow	1	2	3	4	E
Number of Errors					

▼ Start Age 7					SET 6
61. picking	1	2	3	4	E
62. target	1	2	3	4	E
63. dripping	1	2	3	4	E
64. knight	1	2	3	4	E
65. delivering	1	2	3	4	E
66. cactus	1	2	3	4	E
67. dentist	1	2	3	4	E
68. floating	1	2	3	4	E
69. claw	1	2	3	4	E
70. uniform	1	2	3	4	E
71. gigantic	1	2	3	4	E
72. furry	1	2	3	4	E
Number of Errors					

- **Complete Set Rule:** Administer all 12 items in the set in order, starting with the first item in the set.
- **Basal Set Rule:** One (1) or zero (0) errors in a set.
- **Ceiling Set Rule:** Eight (8) or more errors in a set.

▼ Start Age 8					SET 7
73. violin	1	2	3	4	E
74. group	1	2	3	4	E
75. globe	1	2	3	4	E
76. vehicle	1	2	3	4	E
77. chef	1	2	3	4	E
78. squash	1	2	3	4	E
79. ax	1	2	3	4	E
80. flamingo	1	2	3	4	E
81. chimney	1	2	3	4	E
82. sorting	1	2	3	4	E
83. waist	1	2	3	4	E
84. vegetable	1	2	3	4	E
Number of Errors					

▼ Start Age 9					SET 8
85. hyena	1	2	3	4	E
86. plumber	1	2	3	4	E
87. river	1	2	3	4	E
88. timer	1	2	3	4	E
89. catching	1	2	3	4	E
90. trunk	1	2	3	4	E
91. vase	1	2	3	4	E
92. harp	1	2	3	4	E
93. bloom	1	2	3	4	E
94. horrified	1	2	3	4	E
95. swamp	1	2	3	4	E
96. heart	1	2	3	4	E
Number of Errors					

▼ Start Age 10					SET 9
97. pigeon	1	2	3	4	E
98. ankle	1	2	3	4	E
99. flaming	1	2	3	4	E
100. wrench	1	2	3	4	E
101. aquarium	1	2	3	4	E
102. refueling	1	2	3	4	E
103. safe	1	2	3	4	E
104. boulder	1	2	3	4	E
105. reptile	1	2	3	4	E
106. canoe	1	2	3	4	E
107. athlete	1	2	3	4	E
108. towing	1	2	3	4	E
Number of Errors					

▼ Start Ages 11–12					SET 10
109. luggage	1	2	3	4	E
110. directing	1	2	3	4	E
111. vine	1	2	3	4	E
112. digital	1	2	3	4	E
113. dissecting	1	2	3	4	E
114. predatory	1	2	3	4	E
115. hydrant	1	2	3	4	E
116. surprised	1	2	3	4	E
117. palm	1	2	3	4	E
118. clarinet	1	2	3	4	E
119. valley	1	2	3	4	E
120. kiwi	1	2	3	4	E
Number of Errors					

▼ Start Age 13					SET 11
121. interviewing	1	2	3	4	E
122. pastry	1	2	3	4	E
123. assisting	1	2	3	4	E
124. fragile	1	2	3	4	E
125. solo	1	2	3	4	E
126. snarling	1	2	3	4	E
127. puzzled	1	2	3	4	E
128. beverage	1	2	3	4	E
129. inflated	1	2	3	4	E
130. tusk	1	2	3	4	E
131. trumpet	1	2	3	4	E
132. rodent	1	2	3	4	E
Number of Errors					

▼ Start Ages 14–16					SET 12
133. inhaling	1	2	3	4	E
134. links	1	2	3	4	E
135. polluting	1	2	3	4	E
136. archaeologist	1	2	3	4	E
137. coast	1	2	3	4	E
138. injecting	1	2	3	4	E
139. fern	1	2	3	4	E
140. mammal	1	2	3	4	E
141. demolishing	1	2	3	4	E
142. isolation	1	2	3	4	E
143. clamp	1	2	3	4	E
144. dilapidated	1	2	3	4	E
Number of Errors					

- **Complete Set Rule:** Administer all 12 items in the set in order, starting with the first item in the set.
- **Basal Set Rule:** One (1) or zero (0) errors in a set.
- **Ceiling Set Rule:** Eight (8) or more errors in a set.

▼ Start Ages 17–18					SET 13
145. pedestrian	1	2	3	4	E
146. interior	1	2	3	4	E
147. garment	1	2	3	4	E
148. departing	1	2	3	4	E
149. feline	1	2	3	4	E
150. hedge	1	2	3	4	E
151. citrus	1	2	3	4	E
152. florist	1	2	3	4	E
153. hovering	1	2	3	4	E
154. aquatic	1	2	3	4	E
155. reprimanding	1	2	3	4	E
156. carpenter	1	2	3	4	E
Number of Errors					

▼ Start Ages 19–Adult					SET 14
157. primate	1	2	3	4	E
158. glider	1	2	3	4	E
159. weary	1	2	3	4	E
160. hatchet	1	2	3	4	E
161. transparent	1	2	3	4	E
162. sedan	1	2	3	4	E
163. constrained	1	2	3	4	E
164. valve	1	2	3	4	E
165. parallelogram	1	2	3	4	E
166. pillar	1	2	3	4	E
167. consuming	1	2	3	4	E
168. currency	1	2	3	4	E
Number of Errors					

					SET 15
169. hazardous	1	2	3	4	E
170. pentagon	1	2	3	4	E
171. appliance	1	2	3	4	E
172. poultry	1	2	3	4	E
173. cornea	1	2	3	4	E
174. peninsula	1	2	3	4	E
175. porcelain	1	2	3	4	E
176. detonation	1	2	3	4	E
177. cerebral	1	2	3	4	E
178. perpendicular	1	2	3	4	E
179. submerging	1	2	3	4	E
180. syringe	1	2	3	4	E
Number of Errors					

					SET 16
181. lever	1	2	3	4	E
182. apparel	1	2	3	4	E
183. talon	1	2	3	4	E
184. cultivating	1	2	3	4	E
185. wedge	1	2	3	4	E
186. ascending	1	2	3	4	E
187. depleted	1	2	3	4	E
188. sternum	1	2	3	4	E
189. maritime	1	2	3	4	E
190. incarcerating	1	2	3	4	E
191. dejected	1	2	3	4	E
192. quintet	1	2	3	4	E
Number of Errors					

Continue on page 6

- **Complete Set Rule:** Administer all 12 items in the set in order, starting with the first item in the set.
- **Basal Set Rule:** One (1) or zero (0) errors in a set.
- **Ceiling Set Rule:** Eight (8) or more errors in a set.

SET 17					
193. **incandescent** [in kuhn DES uhnt]	1	2	3	4	E
194. **confiding** [kuhn FIYD ing]	1	2	3	4	E
195. **mercantile** [MUR kuhn teel]	1	2	3	4	E
196. **upholstery** [uhp HOHL stuh ree]	1	2	3	4	E
197. **filtration** [fil TRAY shuhn]	1	2	3	4	E
198. **replenishing** [ri PLE nish ing]	1	2	3	4	E
199. **trajectory** [truh JEK tuh ree]	1	2	3	4	E
200. **perusing** [puh ROOZ ing]	1	2	3	4	E
201. **barb** [BARB]	1	2	3	4	E
202. **converging** [kuhn VUHRJ ing]	1	2	3	4	E
203. **honing** [HOHN ing]	1	2	3	4	E
204. **angler** [AN gluhr]	1	2	3	4	E
Number of Errors					

SET 18					
205. **wildebeest** [WIL duh beest]	1	2	3	4	E
206. **coniferous** [koh NIF uh ruhs]	1	2	3	4	E
207. **timpani** [TIM puh nee]	1	2	3	4	E
208. **pilfering** [PIL fuhr ing]	1	2	3	4	E
209. **pestle** [PE suhl]	1	2	3	4	E
210. **reposing** [ri POHZ ing]	1	2	3	4	E
211. **cupola** [KYOO puh luh]	1	2	3	4	E
212. **derrick** [DER ik]	1	2	3	4	E
213. **convex** [kon VEKS]	1	2	3	4	E
214. **embossed** [im BAWST]	1	2	3	4	E
215. **torrent** [TOHR uhnt]	1	2	3	4	E
216. **dromedary** [DROM uh dayr ee]	1	2	3	4	E
Number of Errors					

SET 19					
217. **legume** [LE gyoom]	1	2	3	4	E
218. **cairn** [KAYRN]	1	2	3	4	E
219. **arable** [AYR uh buhl]	1	2	3	4	E
220. **supine** [suu PIYN]	1	2	3	4	E
221. **vitreous** [VI tree uhs]	1	2	3	4	E
222. **lugubrious** [luu GOO bree uhs]	1	2	3	4	E
223. **caster** [KAS tuhr]	1	2	3	4	E
224. **terpsichorean** [tuhrp sik uh REE uhn]	1	2	3	4	E
225. **cenotaph** [SEN uh taf]	1	2	3	4	E
226. **calyx** [KAY liks]	1	2	3	4	E
227. **osculating** [OS kyuh layt ing]	1	2	3	4	E
228. **tonsorial** [ton SOHR ee uhl]	1	2	3	4	E
Number of Errors					

Pronunciation Key

ay = long a	u = short u	oo as in *loot*	ee = long e	j = soft g	uh as in *shove*	iy = long i
g = hard g	oy as in *coin*	oh = long o	s = soft c	ar as in *form*	yoo = long u	k = hard c
uhr as in *circle*	a = short a	ow as in *loud*	ir as in *cheer*	e = short e	aw as in *law*	ayr as in *choir*
i = short i	uu as in *foot*	ohr as in *shore*	o = short o			

Note: CAPS within pronunciation indicate primary stress.

Classification by Part of Speech for the *Peabody Picture Vocabulary Test*, Fourth Edition (PPVT™–4), Form A

Directions: Circle the item numbers of the lowest and highest PPVT–4 items administered. For incorrect responses, draw a line through the open box to the right of the item number. Tally and sum each category column. Then, write the totals by category for # Taken and # Incorrect in the summary box to the right.

Totals	PPVT–4 Form A		
	Noun	Verb	Attribute
# Taken			
# Incorrect			

Item	Noun	Verb	Attribute	Item	Noun	Verb	Attribute	Item	Noun	Verb	Attribute	Item	Noun	Verb	Attribute	Item	Noun	Verb	Attribute	Item	Noun	Verb	Attribute
1				39				77				115				153				191			
2				40				78				116				154				192			
3				41				79				117				155				193			
4				42				80				118				156				194			
5				43				81				119				157				195			
6				44				82				120				158				196			
7				45				83				121				159				197			
8				46				84				122				160				198			
9				47				85				123				161				199			
10				48				86				124				162				200			
11				49				87				125				163				201			
12				50				88				126				164				202			
13				51				89				127				165				203			
14				52				90				128				166				204			
15				53				91				129				167				205			
16				54				92				130				168				206			
17				55				93				131				169				207			
18				56				94				132				170				208			
19				57				95				133				171				209			
20				58				96				134				172				210			
21				59				97				135				173				211			
22				60				98				136				174				212			
23				61				99				137				175				213			
24				62				100				138				176				214			
25				63				101				139				177				215			
26				64				102				140				178				216			
27				65				103				141				179				217			
28				66				104				142				180				218			
29				67				105				143				181				219			
30				68				106				144				182				220			
31				69				107				145				183				221			
32				70				108				146				184				222			
33				71				109				147				185				223			
34				72				110				148				186				224			
35				73				111				149				187				225			
36				74				112				150				188				226			
37				75				113				151				189				227			
38				76				114				152				190				228			
# Taken				# Taken				# Taken				# Taken				# Taken				# Taken			
# Incorrect				# Incorrect				# Incorrect				# Incorrect				# Incorrect				# Incorrect			

Product Number 30706 (25)
30708 (100)

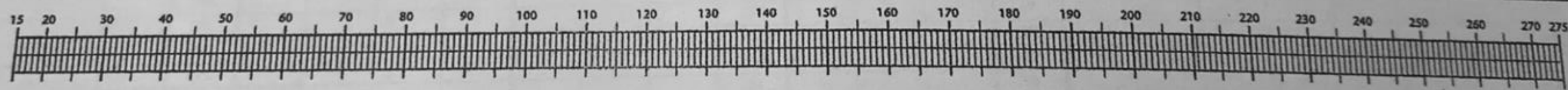
Comparison of PPVT™-III and PPVT–4 Scores Over Time

Administration Date	Edition and Form: PPVT-III		Edition and Form: PPVT–4		Standard Score: Norms			Standard Score: Score*	Raw Score	GSV*
______	☐ A	☐ B	☐ A	☐ B	☐ Age	☐ Grade: Fall	☐ Grade: Spring	______	______	______
______	☐ A	☐ B	☐ A	☐ B	☐ Age	☐ Grade: Fall	☐ Grade: Spring	______	______	______
______	☐ A	☐ B	☐ A	☐ B	☐ Age	☐ Grade: Fall	☐ Grade: Spring	______	______	______
______	☐ A	☐ B	☐ A	☐ B	☐ Age	☐ Grade: Fall	☐ Grade: Spring	______	______	______
______	☐ A	☐ B	☐ A	☐ B	☐ Age	☐ Grade: Fall	☐ Grade: Spring	______	______	______
______	☐ A	☐ B	☐ A	☐ B	☐ Age	☐ Grade: Fall	☐ Grade: Spring	______	______	______

(Table B.7)

*** Do not compare standard scores across editions (i.e., PPVT-III and PPVT–4 scales). GSV scores may be compared across editions.**

Using GSV Scores to Measure Change



The GSV (growth scale value) score is designed for measuring change over time. Like a raw score, the GSV score is an indicator of absolute, not relative, performance. If an examinee's vocabulary increases, his or her GSV score will increase. The GSV scale is like a yardstick, and plotting GSV scores over time can reveal how the examinee's vocabulary performance has changed.

The standard score serves a different purpose, which is to tell how the examinee's score compares with the average score at a particular age. It is a helpful supplement to the GSV when evaluating change. If an examinee's standard scores are the same on both occasions, then the examinee's vocabulary performance has increased at the average rate for that age. If the standard score declines from the first testing to the next, the examinee still may have improved in vocabulary knowledge (as shown by a higher GSV), but the rate of growth was below average.

Refer to Appendix G in the PPVT–4 Manual for further information on interpreting change in GSV scores.

To use the GSV "yardstick" to show changes in performance over time, complete the following steps:

1. Write a sequence number next to the GSV score of each PPVT-III and PPVT–4 administration you entered on this page, starting with 1 for the earliest administration.
2. Mark the points on the GSV yardstick corresponding to each GSV score.
3. Write the corresponding administration sequence number next to each mark on the GSV yardstick.

PEARSON

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PsychCorp

Official use:
Participant _

Appendix P

Procedural Integrity Script

Checklist for Tasks	Completed (please ✓)
Day 1:	
Confirm Consent Form is signed	
Obtain Participant Assent	
Pre-test Task: Noun Knowledge Task	
Short motivational task (if needed)	
Pre-test Task: Preposition Knowledge Task	
Short motivational task (if needed)	
Pre-test Task: Matching Task	
Short motivational task (if needed)	
Peabody Picture Vocabulary Test (PPVT)	
Childhood Autism Rating Scale (CARS)	
Token	
Day 2:	
Obtain Participant Assent	
Trial Directives	
Directives Task (Group 1 or Group 2)	
Token	

Official use: *Participant _*

Day 2: Trial Directives

Procedure	Script	Completed (please ✓)	Official use
Participant Assent Obtained			
Inform participant that we are starting with some examples	*We are going to start now. You need to listen carefully and look at the pictures on the iPad.*		
	I am going to put two toys on the table.		
	I will ask you to move the toys around.		
Trial 1. Put the **doll** and **box** in front of the participant.			
Start PCS on the iPad. Point to the relevant PCS on the iPad and say:	**Put the doll IN the box**		
If child responds appropriately go to Trial 3. If child does not respond repeat: Demonstrate required action whilst repeating instruction.	**Put the doll IN the box**		
Trial 2. Remove previous toys. Put the **spoon** and **car** in front of the participant.			
Start PCS on the iPad. Point to the relevant PCS on the iPad and say:	**Put the spoon IN FRONT of the car**		
If child responds appropriately go to Trial 3. If child does not respond repeat: Demonstrate required action whilst repeating instruction.	**Put the spoon in IN FRONT of the car**		
Trial 3. Remove previous toys. Put the **doll** and **box** in front of the participant.			
Start PCS on the iPad. Point to the relevant PCS on the iPad and say:	**Put the DOLL IN FRONT of the BOX**		
If child responds appropriately go to Directive Task. If child does not respond repeat: Demonstrate required action whilst repeating instruction.	**Put the DOLL IN FRONT of the BOX**		
Trial 4. Remove previous toys. Put the **cap** and **bowl** in front of the participant.			
Start PCS on the iPad. Point to the relevant PCS on the iPad and say:	**Put the CAP IN the BOWL**		
If child responds appropriately go to Experimental Tasks. If child does not respond repeat: Demonstrate required action whilst repeating instruction.	**Put the CAP IN the BOWL in the bowl**		
Start Directives Task			

Day 2: Directive Task Group 1 (Condition 1 then Condition 2)

Procedure	Script	Completed (please ✓)	Official use
Participant Assent Obtained			
Turn on Recording equipment			
Inform the participant that we are starting with the experimental task	*You are going to start listening to how you must move the toys around.*		
	I will record you while you are moving the toys around.		
Tell the participant what s/he will be doing.	*You need to listen carefully and look at the pictures on the iPad.*		
	I am going to put two toys on the table.		
	I will ask you to move the toys around.		
	We are going to start.		
Aided Instructions			
1. Put the **spoon** and **bowl** in front of the participant			
Start PCS on iPad Point to iPad & say:	**Put the spoon ON the bowl**		
2. Remove previous toys Put the **cap** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the cap UNDER the bowl**		
3. Remove previous toys Put the **doll** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the doll BEHIND the bowl**		
4. Remove previous toys Put the **spoon** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the spoon NEXT TO the bowl**		

5. Remove previous toys Put the **doll** and **car** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the doll ON the car**		
6. Remove previous toys Put the **cap** and **box** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the cap NEXT TO the box**		
7. Remove previous toys Put the **cap** and **box** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the CAP ON the BOX**		
8. Remove previous toys Put the **doll** and **box** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the DOLL UNDER the BOX**		
9. Remove previous toys Put the **spoon** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the SPOON BEHIND the BOWL**		
10. Remove previous toys Put the **doll** and **car** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the DOLL NEXT TO the CAR**		
11. Remove previous toys Put the **spoon** and **car** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the SPOON UNDER the CAR**		
12. Remove previous toys Put the **doll** and **car** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the DOLL NEXT TO the CAR**		
Remove the toys from the table			
Thank the participant	*We are done now!* *Thank you very much.* *You are a star.*		
Give participant token			
Turn off recording equipment			
Take participant back to class			

Completed By: _____ Checked By: _____

Official use: *Participant _*

Day 2: Directive Task Group 2 (Condition 2 then Condition 1)

Procedure	**Script**	**Completed** (please ✓)	**Official use**
Participant Assent Obtained			
Turn on Recording equipment			
Inform the participant that we are starting with the experimental task	*You are going to start listening to how you must move the toys around.*		
	I will record you while you are moving the toys around.		
Tell the participant what s/he will be doing.	*You need to listen carefully and look at the pictures on the iPad.*		
	I am going to put two toys on the table.		
	I will ask you to move the toys around.		
	We are going to start.		
Aided Instructions			
1. Put the **cap** and **box** in front of the participant			
Start PCS on iPad Point to iPad & say:	**Put the CAP ON the BOX**		
2. Remove previous toys Put the **doll** and **box** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the DOLL UNDER the BOX**		
3. Remove previous toys Put the **spoon** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the SPOON BEHIND the BOWL**		
4. Remove previous toys Put the **doll** and **car** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the DOLL NEXT TO the CAR**		

5. Remove previous toys Put the **spoon** and **car** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the SPOON UNDER the CAR**		
6. Remove previous toys Put the **doll** and **car** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the DOLL NEXT TO the CAR**		
7. Place the **spoon** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the spoon ON the bowl**		
8. Remove previous toys Put the **cap** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the cap UNDER the bowl**		
9. Remove previous toys Put the **doll** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the doll BEHIND the bowl**		
10. Remove previous toys Put the **spoon** and **bowl** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the spoon NEXT TO the bowl**		
11. Remove previous toys Put the **doll** and **car** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the doll ON the car**		
12. Remove previous toys Put the **cap** and **box** in front of the participant			
Change PCS on iPad Point to iPad & say:	**Put the cap NEXT TO the box**		
Remove the toys from the table			
Thank the participant	*We are done now!* *Thank you very much.* *You are a star.*		
Give participant token			
Turn off recording equipment			
Take participant back to class			

Completed By: _____ Checked By: _____

Appendix Q

Record Form

Official use: *Participant _*

Script 1 (Group 1)

Trial	Directive	(-)	(=)
1	Put the doll *IN the box		
2	Put the spoon *IN FRONT OF the car		
3	Put the *DOLL *IN FRONT OF the *BOX		
4	Put the *CAP *IN the *BOWL		

Condition and no.	Directive	(-)	(=)
C1.1	Put the spoon *ON the bowl		
C1.2	Put the cap *UNDER the bowl		
C1.3	Put the doll *BEHIND the bowl		
C1.4	Put the spoon *NEXT TO the bowl		
C1.5	Put the doll *ON the car		
C1.6	Put the cap *NEXT TO the box		
C2.1	Put the *CAP *ON the *BOX		
C2.2	Put the *DOLL *UNDER the *BOX		
C2.3	Put the *SPOON *BEHIND the *BOWL		
C2.4	Put the *DOLL *NEXT TO the *CAR		
C2.5	Put the *SPOON *UNDER the *CAR		
C2.6	Put the *CAP *BEHIND the *CAR		

* Text in CAPS was represented with PCS

Completed By: _____ Checked By: _____

Script 2 (Group 2)

Official use:
Participant _

Trial	Directive	(-)	(=)
1	Put the doll *IN the box		
2	Put the spoon *IN FRONT OF the car		
3	Put the *DOLL *IN FRONT OF the *BOX		
4	Put the *CAP *IN the *BOWL		

Condition and no.	Directive	(-)	(=)
C2.1	Put the *CAP *ON the *BOX		
C2.2	Put the *DOLL *UNDER the *BOX		
C2.3	Put the *SPOON *BEHIND the *BOWL		
C2.4	Put the *DOLL *NEXT TO the *CAR		
C2.5	Put the *SPOON *UNDER the *CAR		
C2.6	Put the *CAP *BEHIND the *CAR		
C1.1	Put the spoon *ON the bowl		
C1.2	Put the cap *UNDER the bowl		
C1.3	Put the doll *BEHIND the bowl		
C1.4	Put the spoon *NEXT TO the bowl		
C1.5	Put the doll *ON the car		
C1.6	Put the cap *NEXT TO the box		

* Text in CAPS was represented with PCS

Completed By: _____ Checked By: _____

Official use:
*Participant_*

Appendix R
Pre-test Task

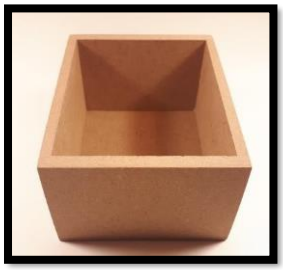
NOUN KNOWLEDGE Instruction	**Presented with:**		**(=)**	**(-)**
Give me the **doll**	Spoon	Car		
Give me the **bowl**	Teddy bear	Truck		
Give me the **spoon**	Cap	Box		
Give me the **car**	Box	Truck		
Give me the **cap**	Doll	Bowl		
Give me the **box**	Bowl	Spoon		
Give me the **truck**	Doll	Cap		
Give me the **teddy**	Car	Spoon		

PREPOSITION KNOWLEDGE Instruction	**Presented with:**		**(=)**	**(-)**
Put the teddy bear in front of the truck	Teddy bear	Truck		
Put the teddy bear on the truck	Teddy bear	Truck		
Put the teddy bear next the truck	Teddy bear	Truck		
Put the teddy bear behind the truck	Teddy bear	Truck		
Put the teddy bear under the truck	Teddy bear	Truck		

MATCHING SKILLS Instruction: *Point to Picture Communication Symbol (PCS) simultaneously*	**Presented with:**		**(=)**	**(-)**
"Give me this one" Spoon	Cap	Car		
"Give me this one" Cap	Bowl	Doll		
"Give me this one" Doll	Cap	Box		
"Give me this one" Car	Box	Spoon		
"Give me this one" Box	Doll	Bowl		
"Give me this one" Bowl	Car	Spoon		

Appendix S

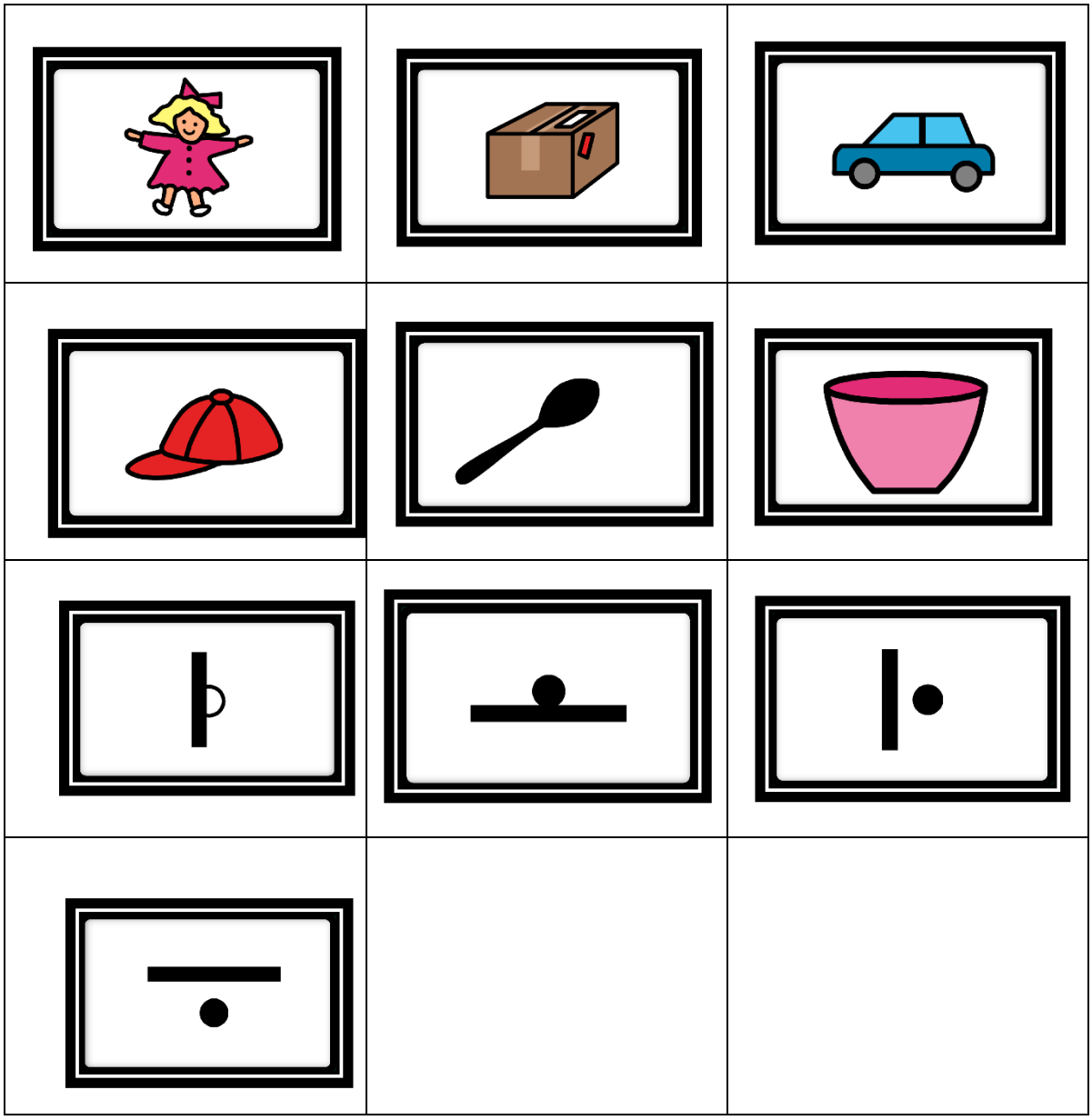
Toy objects for use in directives

Photographs of Objects		
Doll 	Bowl 	Truck 
Teddy 	Spoon 	Car 
Box 	Cap 	

Appendix T

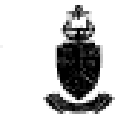
PCS for use in directives task

Symbols for the aided input in directive (to be presented using the Go Talk NOW application):



Appendix U

Permission from schools



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Faculty of Humanities

School Principal Reply slip

I, [redacted] name), hereby grant the researcher permission for the research study.

Please tick below:

☒ I do consent to participate in the study

1) We have received and read the request as well as the information letter
2) We understand the requirements for the completion of the study
3) We hereby permit Rafeeyah Hassim to conduct the study in accordance with the requirements stipulated in the letter

OR

☐ I do not consent to participate in the study

Sig[redacted] Sig[redacted]

Sig[redacted] on 2[redacted]

[redacted]

[redacted]

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Lefapha la Bomotho

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Faculty of Humanities

School Principal Reply slip

I, [redacted] name), hereby grant the researcher permission for the research study.

Please tick below:

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1) We have received and read the request as well as the information letter
2) We understand the requirements for the completion of the study
3) We hereby permit Rafeeyah Hassim to conduct the study in accordance with the requirements stipulated in the letter

OR

☐ I do not consent to participate in the study

[redacted] [redacted]

Signature of school principal Sig

Signed at [redacted] on 21 of [illegible] 201[illegible]

[redacted]

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Appendix V

Declaration of Originality

UNIVERSITY OF PRETORIA
DECLARATION OF ORIGINALITY

This document must be signed and submitted with every essay, report, project, assignment, dissertation and/or thesis.

Full names of student: Rafeeyah Hassim

Student number: 18376216

Declaration

1. I understand what plagiarism is and am aware of the University's policy in this regard.

2. I declare that this ….**Mini Dissertation**…. (eg essay, report, project, assignment, dissertation, thesis, etc) is my own original work. Where other people's work has been used (either from a printed source, Internet or any other source), this has been properly acknowledged and referenced in accordance with departmental requirements.

3. I have not used work previously produced by another student or any other person to hand in as my own.

4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

SIGNATURE OF STUDENT:

SIGNATURE OF SUPERVISOR:

Appendix W

Declaration of Statistical Analysis

TO WHOM IT MAY CONCERN

STATISTICAL ANALYSIS OF DATA:

Student: RAFEEYAH HASSIM

I hereby certify that the data processing was performed by myself and that the statistical analysis and interpretation for the empirical study of the above, was done under the supervision of Saira Abdulla. I have also read the results chapter of the particular thesis, and agree with the information presented.

Signature of statistician

Saira Abdulla
Name of statistician

10/06/2019
DATE

Appendix X

Declaration of Language Editor

DECLARATION

I herewith declare that I,

Isabel M Claassen (APSTrans (SATI)),

full-time freelance translator, editor and language consultant

of
1367 Lawson Avenue, Waverley, Pretoria
(cell 082 701 7922)

and
accredited member (No. 1000583) of the South African Translators' Institute (SATI)

completed the *language editing** of a mini-dissertation entitled

Effects of varied dosages of aided input on following directives that contain prepositions for children with Autism Spectrum Disorder (ASD)

which had been submitted to me by

Rafeeyah Hassim

Cell: +27721378613
E-mail: rafeeyah.hassim@gmail.com

Date completed: 20-06-2019

Please note that no responsibility can be taken for the veracity of statements or arguments in the document concerned or for changes made subsequent to the completion of language editing. Also remember that content editing is not part of a language editor's task and is in fact unethical.

Appendix Y

Feedback Brochure

Compiled by:
Rafeeyah Hassim
Supervisor:
Professor
Shakila Dada

Email: shakila.dada@up.co.za OR rafeeyah.hassim2@gmail.com

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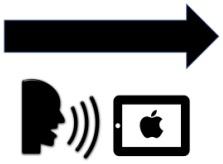
Centre for Augmentative & Alternative Communication
University of Pretoria

Effects of varied dosage of aided input on following directives (instructions) that contain prepositions for children with Autism Spectrum Disorder (ASD)

What is aided input?

Aided (augmented) input is using spoken words and graphic symbols simultaneously.



Aim: To determine the effect that varied dosages of aided input have on the ability of children with ASD to follow instructions that contain prepositions.

Why we did the study?

Children with ASD often have difficulty understanding spoken directives. They may also have difficulty understanding abstract language such as prepositions. Aided input, may facilitate children with ASD ability to follow instructions.

How did we collect information?

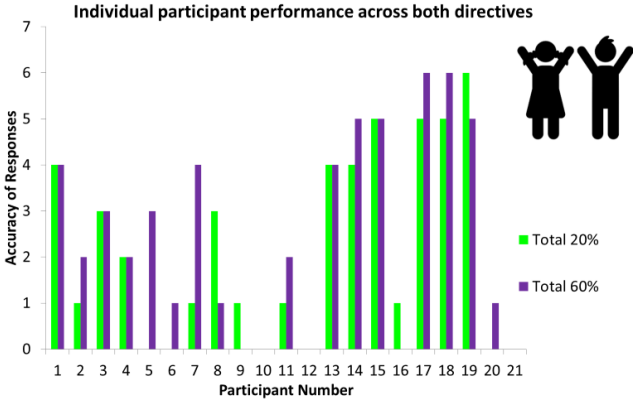
Children with ASD (n=21) were recruited from 2 schools. They were assessed to determine if they met the selection criteria.

The children were asked to follow 12 instructions for example *Put the cap on the box.* The instructions were supported with varied amounts of aided input i.e. 20% and 60%.

What did we find?

The results indicated that some children with ASD (n=9) who received a higher level of aided input (60%) were able to respond more accurately than those who received a lower level of aided input (20%). However, no statistically significant differences between the conditions (60% versus 20%) was noted. The Test of Normality (Shapiro-Wilk Test), suggested that the *p value* was not significant. In the condition comparison (Mann-Whitney Test), there was no statistically significant difference ($p = 0.165$) in scores for participants in the two conditions. The results suggest that graphic symbols with speech can help some children with ASD to understand directives better.

The graph below illustrates the overall number of correct responses for each directive across the 21 participants.



What does it mean?

Aided input may help some children with ASD to understand instructions better. There are however variations in terms of who may benefit from more aided input (60%) and those that benefit more from less aided input (20%).

Conclusion: It was concluded that the 60% aided input level yielded a higher accuracy of responses than the 20% aided input level in some children with ASD. In addition, the results suggest that augmenting spoken language was advantageous in some children with ASD.

Acknowledgment: The financial assistance of The National Research Foundation (NRF) through a grant-holder linked bursary is acknowledged. Opinions expressed in this pamphlet and conclusions arrived at are those of the authors and not attributed to the funders. The assistance of staff at schools as well as families and the children involved in the study are gratefully acknowledged.

NRF National Research Foundation