CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

The research methodology of the study is described in this chapter. The research question, aims and sub-aims of the study are presented. These are followed by a discussion of the research design. Discussion of the pilot study with regard to the results and recommendations is then presented. The participants, materials and equipment, which were used in the study, are discussed. Lastly, the procedure for data collection and data analyses is described.

3.2 RESEARCH QUESTION

Does a non-spoken response (eye-gaze) deliver equivalent results to a spoken response in a test of phonological awareness in typically developing Grade One children?

3.3 AIMS OF THE STUDY

3.3.1 Main Research Aim

The aim of this study was to investigate whether a non-spoken response mode (eye-gaze) would render equivalent results to a spoken response mode in a test of phonological awareness in typically developing English First Language and English Second Language, Grade One children.

3.3.2 Sub-aims

The main aim of this study was realized by means of three sub-aims. These were:

i. To determine the spoken and non- spoken responses of typically developing Grade One children in a test of phonological awareness which only required a "Yes" or "No" response.

iii. To compare the non-spoken results with the spoken results of the target population.

iii. To determine whether the order of presentation of the spoken versus the non-spoken response mode, the order in which the tasks were presented and the order in which the task items were presented affected the outcomes of the assessment.

3.4 RESEARCH DESIGN

3.4.1 The Research Design

This study utilized a quasi-experimental crossover and within group design between two groups of typically developing Grade One, English First Language and English Second Language children. A crossover design enables a within group comparison (Jones & Kenwood, 1989). Its aim was to ascertain whether the children's performance on a phonological awareness assessment battery (requiring only a "Yes" or "No" answer) using both a non-spoken and a spoken mode of response was equivalent. The non-spoken mode of response required the children to answer the questions using eye-gaze only (by looking at the top left hand corner of the E-tran board to indicate "Yes", or by looking at the bottom right hand corner of the E-tran to indicate "No"). The spoken mode simply involved the children responding with a verbal "Yes" or "No".

Table 3.1 provides a visual representation of the research design for the three reading cohorts within Group One and Group Two.

Table 3.1 Visual Representation of the Research Design for the Above-Average, Average and Below-Average Cohorts.

Group One			**Group Two**
Above-average reading cohort			
Task 1 Spoken Response Non - Spoken Response	↑	Inter - group - comparison →	↑ **Task 1** Non - Spoken response Spoken response
Task 2 Non - Spoken response Spoken response	Within Group Comparison		Within Group Comparison **Task 2** Spoken Response Non - Spoken Response
Task 3 Non - Spoken response Spoken response	↓	Inter - group- comparison →	↓ **Task 3** Spoken Response Non - Spoken Response
Total number of questions: 90			**Total number of questions: 90**
Average reading cohort			
Task 3 Spoken Response Non - Spoken Response	↑	Inter - group - comparison →	↑ **Task 3** Non - Spoken response Spoken response
Task 1 Non - Spoken response Spoken response	Within Group Comparison		Within Group Comparison **Task 1** Spoken Response Non - Spoken Response
Task 2 Non - Spoken response Spoken response	↓	Inter - group- comparison →	↓ **Task 2** Spoken Response Non - Spoken Response
Total number of questions: 90			**Total number of questions: 90**
Below-average reading cohort			
Task 2 Spoken Response Non - Spoken Response	↑	Inter - group - comparison →	↑ **Task 2** Non - Spoken response Spoken response
Task 3 Non - Spoken response Spoken response	Within Group Comparison		Within Group Comparison **Task 3** Spoken Response Non - Spoken Response
Task 1 Non - Spoken response Spoken response	↓	Inter - group- comparison →	**Task 1** Spoken Response Non - Spoken Response
Total number of questions: 90			**Total number of questions: 90**

3.4.2 The Research Steps

The research steps, which followed a linear course, are as follows:

i. Development of a phonological awareness test based on the literature, which focuses on assessing the first two levels of phonological awareness, namely: rhyme recognition, and recognition of the sameness of initial and final sounds in monosyllabic words. See Section 3.5 for a description and discussion of the test.

ii. Identification of a school in the Pretoria area which has 100 children on the roll in Grade One and whose medium of instruction is English.

iii. Conducting a pilot study to pretest the phonological awareness test. The information gleaned from the pilot study indicated that certain minor organizational changes were necessary for smoother flow. See Section 3.4.3.1 for a discussion of the pilot study.

iv. Conducting the main study. The fieldwork was undertaken over a period of five consecutive days. Data collection procedures are discussed in Section 3.6.

v. Data capture and analysis. Raw data was coded in pre-designed blocks on the data collection sheet to facilitate data capturing by the computer (See Appendix B). The data was coded according to age, race, gender, group, home language, reading cohort, time, mode of response, order of items presented and language group (See Appendix C). Once the results had been computerized, statistical analysis using ANOVA and the Mann-Whitney Test was conducted. An interpretation and discussion of the data, highlighting the relevance of the study, then followed.

3.4.3 Pilot study

3.4.3.1 Objectives

A pilot study was conducted using three typically developing Grade One children whose results were excluded from the main study. These three children came from different

classes in one school in the Pretoria district. Each child represented one reading ability cohort, namely the above-average, the average and the below-average reading cohorts. The objectives of the pilot study were:

i. To determine whether the test instructions were understood by the participants.
ii. To determine whether the presentation steps in the spoken and non-spoken modes were appropriate.
iii. To determine the amount of time required to complete the test as well as for the changeover from one participant to the next.
iv. To determine the consistency of responses by using the different response modes.
v. To determine the number of items necessary for the test to render consistency.
vi. To determine whether the coding strategies were appropriate.
vii. To control for random behaviour.

3.4.3 School Selected for the Pilot Study

The pilot study was conducted in the same school as the one that was selected for the main study. It is a privately funded school for typically developing children in the Pretoria area. The medium of instruction is English. See Section 3.5.1 for a description of the school and participants.

3.4.3.3 Procedure

The pilot study followed the same format as the one discussed in the main study (See Section 3.5). The pilot study, however, made use of a video set on a tripod, which was not used during the main study.

A pilot study was undertaken to pre-test the assessment as well as the assessment procedures. The resulting information required certain changes to be made to the organizational aspects of the assessment.

3.4.3.4 Aims, Methods and Results

The aims, methods and results of the pilot study are presented in Table 3.2

Table 3.2 Pilot Study: Aims, Methods, Results and Recommendations

AIMS	METHODS	RESULTS	RECOMMENDATIONS
To determine whether the test instructions were understood by the participants.	Present the test, as it would be for the main study.	The subjects understood the questions well.	Instructions were not altered.
To determine whether the randomized order in the spoken and non-spoken modes were appropriate.	The response modes were randomized prior to commencement of the test.	No difference was found between the order of the spoken vs. the non-spoken response modes.	Randomization was not altered.
To determine response Reliability between English First Language (EFL) and English Second Language (ESL).	Two EFL children and one ESL child were used. Children in English medium South African schools are often ESL but are assessed in the language of instruction.	No difference was found between the children from the two language groups.	EFL and ESL children were used for the main study.
To determine the amount of time required to complete the test.	A stopwatch was used to time the children for the duration of the test.	It took an average of20 minutes to complete the test. An average changeover time of six minutes was needed	A randomized list was given to the teacher to accelerate changeover rate.
To determine how consistently the students responded by using the different modes as well as to control for random behaviour.	Each response was recorded on the record sheet. I meant correct and 0 meant incorrect. Observation for random behaviour was conducted.	Consistency was high. The number of correct responses was almost identical for each mode. No random behaviour occurred	Any random behaviour that might occur should be written down on the response sheet.
To determine whether the number of items for the test would be too fatiguing to administer in one day.	The three tasks were carried out as shown in Appendix A.	The number of items in the test was managed by the children wm all three reading cohorts.	The three tests should be conducted on one day.
To determine how easy it would be to administer the test with the various randomization factors.	Observation and awareness of possible pitfalls that may have arisen due to the ordering effect of the test was conducted,	Test questions should be placed in files according to the order in which they will be given to the children. This will eliminate some administrative confusion.	The tests were set out in the order in which they each reading cohort

3.4.3.5 Summary

Some minor organizational modifications were necessary for smooth implementation of the test. Due to the randomization of the order in which the tasks were presented to the children from the different reading cohorts, it was necessary to have the order of the tasks for the three reading cohorts prepared on separate colour-coded sheets to ensure that the tester presented tasks in the correct order. See Table 3.1 for the order of tasks presented to the three reading cohorts.

3.5 MAIN STUDY

3.5.1 Description of the School and Participants

A convenience sampling was used. The study took place in Pretoria in the Gauteng Province, South Africa. The school is a private English medium school Children who attend this school are from diverse cultural backgrounds, many of them being from families working within the diplomatic corps. Nine different mother tongues were recorded for the purpose of this study.

Forty-eight subjects from four different mixed abilities classes at one school in the Pretoria district were asked to participate individually in the study. Because the population of children with LNFS is heterogeneous in nature (Higginbotham & Bedrosian, 1995; Light 1988), a non-disabled population was chosen for greater homogeneity of the subjects. This would then assist the researcher in comparing the two response modes.

Two of the Grade One classes were randomly assigned to Group One and the remaining two classes assigned to Group Two, in order to counter-effect any contaminating factors that may have arisen because of the possibility of one of the teacher's emphasis on phonological awareness teaching and training in her daily interactions with the children in her class. From the pool of participants within each participating class, the names of individuals were randomly selected from the list of potential subjects. Final selection was

related to parental approval for participation. The order in which the tasks were presented to the children was randomized according to the reading ability cohorts of above-average, average and below-average, as assessed by the classroom teacher. This was to ensure that in comparing the two modes of response across the two groups, the randomization of the spoken and non-spoken response modes were equal and comparable. The two groups were equally matched according to reading ability cohorts, to counter one group obtaining better scores on the assessment due to better literacy skills. Further, they were matched according to English First Language and English Second Language, so that proficiency in the medium of assessment would not impact on the results obtained.

3.5.1.1 Selection Criteria for all Participants

Of the ninety-eight consent forms that were sent out, eighty-three forms were returned to the school. Three parents would not give consent for their children to participate in the study. Of those three, two provided no reason for their refusal and the third mother contacted the teacher and indicated that her child had recently been through a battery of tests and she did not want her child to have to undergo any more. A summary of the population follows in Table 3.3.

Table 3.3 Visual Representation of Pruning of Participants

Total population in the grade	**98**
Total of returns	**83**
Total refusals to participate	**3**
Sample size	**48**

Of the eighty children whose parental consent forms returned to the school (See Appendix E), twenty-four children were randomly chosen form Group One. Twenty-four children from Group Two were matched according to reading ability and English First Language or English Second Language.

3.5.1.2 Comparability of Experimental Groups

The mean age of Group One was 85.17 months (SD = 3.62) while the mean age of Group Two was 84.17 months (SD =4.21). The median age for Group One was 85 months and the median age for Group Two was 84 months. The maximum age for both groups was 93 months and the minimum age for Group One and Group Two 76 and 75 months respectively. The Mann-Whitney Test indicated a p-value of 0.3150, thereby indicating no statistically significant difference at the 5% level of significance.

The participant selection criteria and procedures are described in Table 3.4.

Table 3.4 Participant Selection Criteria, Method and Motivation for Inclusion

SELECTION CRITERIA	METHOD	MOTIVATION
They must be enrolled in the regular curriculum of the Grade One year.	Class lists were obtained From the principal of the school.	The tasks were aimed at assessing children in the early months of the foundation phase. Typically developing children were chosen so as not to place unnecessary pressure on children who were already experiencing academic difficulties.
The language of instruction Must be English. Receptive and expressive language must be at a Grade One level.	This information was obtained from the principal as well as the class teachers of the school.	The test material was in English.
They must be six or seven years old at the time of assessment.	This information was obtained from the teachers' register.	This is in accordance who the school entrance policy of the Department of Education.
They must have normal hearing, vision and speech.	This information was obtained from the teachers.	Normal hearing, vision and speech were required for the implementation of this study as the children had to follow instructions aurally and respond via the speech or visual mode.
Children with ADHD must be effectively medicated	This information was obtained from the teachers.	Children diagnosed with ADHD and not medicated often display erratic performance, which is not an accurate reflection of ability.

The experimental Groups One and Two were matched according the criteria delineated in Table 3.4. The groups were matched according to reading cohorts of above-average, average and below-average to ensure an even spread of literacy competency across groups. Further, the groups were matched according to EFL and ESL.

3.5.2 Material and Equipment Used in the Study

3.5.2.1 Measuring Instruments: Phonological Awareness Test

The material used in this study was a phonological assessment battery. The main aim of this battery was to answer the research question; *"Does a non-spoken response (eye-gaze) deliver equivalent results to a spoken response in a test of phonological awareness in typically developing, Grade One children"?* To meet the requirements set out by the research question and design, the following phonological awareness battery and response forms were developed (See Appendices A and B). The researcher endeavoured to adhere to the suggestions made by Blischak (1994), which is to provide tasks, which require the least adaptations when assessing persons who use AAC. The words in each of the tasks were chosen to decrease the phonological similarity effect, as described by Conrad (1964), as he found that when items presented together were phonologically similar to each other the ability for accurate recall diminished. An example of an item from each task is shown in Table 3.5. The assessment had a total of 90 items divided into three tasks.

This will now be described.

A Phonological Assessment Battery, that required only "Yes" or "No" responses, was developed for the purpose of this study. The subtests were drawn from the Phonological Awareness Literacy Screening (PALS) (Invernizzi, Meier, Swank & Juel, 1999-2000) and the Test of Phonological Awareness (TOP A) (Torgesen & Bryant, 1994). It included the following sub-sections:

i. Task 1 - *Rhyme recognition* taken from the Phonological Awareness Literacy Screening (Invernizzi et al., 1999- 2000)

ii. Task 2 - *Initial sound same* taken from the Test of p~ Awareness «Torgesen & Bryant, 1994).

iii. Task 3 - *Ending sounds-same* taken from the Test of Phonological Awareness (Torgesen & Bryant, 1994).

Table 3.5 provides a description of the questions posed in the phonological awareness assessment. The task instruction, type of question asked and mofu13tion are provided. See Appendix A for the full text.

Table 3.5 Summary of Questions Posed in the Phonological Awareness Assessment

TASK	INSTRUCTION	QUESTION	MOTIVATION
RHYME RECOGNITION	Listen to this word - **man**. One of these words that I am going to say will rhyme with man. Listen carefully. - **Five, bed, can.**	1. Do man & five rhyme? 2. Do man & bed rhyme? 3. Do man & can rhyme?	Developmentally, this is the easiest level of phonological awareness. The closed-ended manner in which the questions are posed requires very little load on working memory.
INITIAL SOUND-SAME	Listen to this word **bat**. One of these words that I am going to say will begin with the "**b**" sound just like the "**b**" sound you hear in bat. Listen carefully. - **Bird, lips, ring.**	1. Do bat and bird begin with the same sound? 2. Do bat and lips begin with the same sound? 3. Do bat and ring begin with the same sound?	Developmentally, this is the next easiest level of phonological awareness. The manner in which the questions are posed requires very little load on working memory.
ENDING SOUND-SAME	Listen to this word - **ball**. One of these words that I am going to say will end with the "**l**" sound just like the "**l**" sound you hear in ball Listen carefully. – **Smile, horn. duck.**	1. Do ball and smile end with the same sound? 2. Do ball and horn end with the same sound? 3. Do ball and duck end with the same sound?	Developmentally, this is the next easiest level of phonological awareness. The manner in which the questions are posed requires very little load on working memory.

3.5.2.2 Equipment

i. Recording sheets and pencil (See Appendix B for recording sheet).
ii. Teacher's chair and table, as well as a child's chair.
iii. An E-tran attached to an adjustable stand on wheels. An E-tran is a rectangular transparent sheet of plexiglass with a central square cut out of the middle of the sheet. The answer for "Yes" indicated by a tick as well as the written word was placed on a green cardboard square and was stuck on the top left hand corner of the E-tran with Prestik, while the answer depicting "No" indicated by a cross and the written word was placed on red cardboard and was stuck with Prestik on the bottom right hand corner.

3.6 DATA COLLECTION PROCEDURE

3.6.1 Test Procedure

i. Identification and selection of a junior primary school in the Pretoria area with a roll of 100 Grade One children, whose medium of instruction is English.

ii. Establishment of personal contact with the school was achieved and the nature and purpose of the study was discussed with the school principal as well as with the senior management of the school (See Appendix D). Permission was requested to conduct the study at this school.

iii. The researcher requested the principal to seek permission from the Regional Head Office of his school to conduct the study in one of their schools.

iv. The four Grade One class teachers were approached as a group and permission was requested to select participants from within their respective classes. They were asked

to provide a class list of the children in their classes as well as the reading cohorts into which each child is placed The nature of the study was described, outlining the purpose, procedures as well as benefits of the study. The researcher explained that the children would be answering three tasks on a phonological awareness test under two conditions, namely a spoken Yes/No response and a non-spoken Yes/No response using eye-gaze on an E-tran. It was explained that the children would be tested for both response modes individually in a quiet room away from the classroom. The researcher also showed the teachers the E-tran board and demonstrated how the children would use it in order to respond to the questions posed.

v. The teachers were requested to hand out a letter with a detachable consent form to the parents of all the children in their classes (See Appendix E). They were asked to collect the detachable consent forms for the researcher's records.

vi. Dates and times for data collection, which would result in minimal disruption to the learning outcomes of the children, were mutually agreed upon.

vii. The children were individually tested in a quiet assessment room that was made available by the principal and head of department of the junior phase of the school for purposes of the assessment.

viii. The three tasks were individually administered to each participant. Each task was expected to take five to six minutes to complete, making the total time for each test an average of fifteen to twenty minutes. This was confirmed during the administration of the pilot study.

ix. The children were told that the object of the object of the research was to find out how children think about words and sounds. They were told in a scripted format that the researcher wanted to see whether it is easy for children to "speak with their eyes" by looking at the E-tran to indicate "Yes" or "No". This ensured that each participant was given the same rationale for the rest and that they understood their role in the

procedure. The following was said: "'Thank you for coming to help me today. You are going to answer some questions. Sometimes you will answer by saying "Yes" or "No" and sometimes you will answer by looking at the "Yes" square on the top left hand side of the board and sometimes you will answer "No" by looking at the bottom right hand. After every answer you must look at me through the hole in the middle of the board. At any time that you feel you don't want to do this any more you may tell me, and you may go back to your classroom. Would you like to start?"

x. Identical instructions were given to each child. For all tasks, three practice trials were provided. Here corrective feedback was given to the child. The practice trials were repeated once if necessary. Thereafter the test proceeded. None of the questions were repeated once the practice trials were completed. It was explained to the children that the researcher would no longer be able to assist them and that they must try their best to give the correct answer. The subjects were told that if they did not know the answer they should guess. No feedback was provided to the participants once the practice trials for each task were completed

xi. Children in the above-average reading cohort received the tasks in the following order: Task 1, Task 2 and Task 3. Children in the average reading cohort received the tasks in the following order: Task 3, Task 1 and Task 2, while the children in the below-average reading cohort received the tasks in the following order: Task 2, Task 3 and Task 1. Further, the order in which items within each task was presented was randomized to rule out, firstly, that a learning effect would elevate the results obtained, and secondly, that issues relating to fatigue or boredom would decrease the results obtained. Here the items within each task were presented in either of the following two orders namely: 1-5; 6-10 or 6-10; 1-5.

xii. The ten items within each task were randomly presented to the participants in Group One in the sequence of the spoken mode followed by the non-spoken mode (or vice-versa). The participants in Group Two then received the test in the sequence of the non-spoken mode followed by the spoken mode (or vice-versa). Group One and

Group Two were matched according to reading cohorts as well as English First Language (EFL) and English Second Language (ESL).

xiii. The sequence of the testing of participants was randomized. The researcher prepared and matched the order of the tasks and the sequence of the items to be presented to the participants based on the reading cohorts and language groups prior to the commencement of the assessment. During the administration of the assessment, the researcher was thus not aware of which children from Group One were matched with those in Group Two.

xiv. Both inter-group as well as within group comparisons were made by comparing the performance across both groups and within one group respectively. Table 3.1 provides a visual representation of the research design.

xiv. The subjects' score for each of the three phonological awareness tasks was the total number of correct responses, with the maximum score for each test being 30. In total, each subject was asked ninety questions. As all tests provided the subject with three options, the correct option was placed randomly and occurred with approximately equal frequency in all positions.

xv. The phonological assessment battery was then administered and the responses clearly recorded on the response sheet. A one (1) indicated a correct response and a zero (0) indicated an incorrect response- See Appendix A for verbatim information on the instruction for the testing.

3.6.2 The Use of an Assistant

An assistant was present during the test procedure. For the first two days both the researcher and the assistant scored each participant's responses. A comparison of the responses was undertaken to ensure that equivalence of scoring was achieved. Inter-rater reliability was 100%. Thereafter the researcher and the assistant administered the test on their own.

It took five days to complete the study. Days one and two saw the completion of seven tests respectively. These were administered by the researcher and co-scored by the assistant. Days three and four saw the completion of fourteen tests respectively. The researcher administered seven and the assistant seven tests on both days. Day five saw the completion of the remaining six tests by the researcher.

3.7 DATA ANALYSIS AND STATISTICAL PROCEDURES

3.7.1 Data Capturing

Coded answer forms were used to record the responses of each participant. Each child was given a code, which represented his participation number, race, gender, group, home language, reading cohort and time taken to complete the assessment (See Appendix C). The researcher graded each of the answers on the answer form. The data was then captured by the data typist and a hard copy was printed out. The researcher then compared the data from the printed hard copy with the original data on the coded answer forms to rule out possible printing errors. All demographic information answers were checked for accuracy. The data was organized into groups and analyzed using SAS software. ANOVA and the Mann-Whitney Test were used to analyze the data.

The Mann-Whitney Test was used to obtain a p-Value of the means obtained in the comparison of the ages of Group One and Group Two

The one-way analysis of variance (ANOVA) was used in the study. ANOVA answers the question, "Are there statistically significant differences between the population means?" This study required that two or more sample means were compared on one independent variable. In using the ANOVA procedure, the researcher was able test the different variables both individually and in combination between both groups, thereby making more accurate probability statements than would be possible if using a series of separate *t-tests*. ANOVA uses the analysis of variance and because the statistical formula uses the groups' variances and not the groups' means to calculate a value, this captures the difference in the means (McMillan & Schumacher, 2001).

3.8 SUMMARY

In this chapter, the methodology of the study was described It included the aims and sub-aims as well as the objectives reached. The research design was explained. The selection criteria, descriptive information, material and equipment that were utilized during the pilot and main study were discussed. Finally, data collection procedures and data analysis were discussed.