Study of Inferential Ability in Primary School Children

Usha. A. Dalvi, M.Sc. Speech Language Pathology
N.S. Varsha, M.Sc. Audiology and Speech Language Pathology
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Abstract

The inferential ability of typically developing second and third standard children has been explored in this study. There is a need to study about the inferential ability in reading of children as it would predict their comprehension abilities. This area has received very little attention in Indian context. This cross sectional study aimed to investigate the inferential ability of second and third standard participants, to find the differences in the performance between both the standards, between the gender and finally between good and poor readers. A total of 80 participants with 40 from second standard and the other 40 from third standard maintaining equal gender ratio were selected for the study. The participants were categorized as good and poor readers. The causal inferential ability was explored using developed reading passages where the participant had to select the target word as the appropriate option after reading the passage.

On statistical analysis, it was found that all the participants made some amount of inferences but no significant differences were found between the inferential ability of second and third standard participants and also between the genders. Although statistically there was no significant difference between standard wise performances but qualitatively differences was present. That is there was a steady increase in the performance of third standard participants. The percentage of high inferences increased for third standard indicating their inferential ability is improving. Significant difference was found with a 'p' value <0.05 in the performance between good and poor readers.

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Key words: Inferential ability, causal inference, reading comprehension

Introduction

Inference is an assertion relating to the text that is directly connected to the representation of the text and that was not given in the text itself. Inference making ability is

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the core of understanding process. Inferencing ability develops with experience and age. Oakhill (1982, 1984) found that inability of making inferences as a cause of reading comprehension difficulty. It is important to study the inferential ability of children as it would let us predict their comprehension abilities also this skill is very important in achieving academic proficiency. Also this area has been less explored in the Indian context. Due to these underlying reasons there is a need to explore the inferential ability in children.

Reading comprehension is a process of simultaneously extracting and constructing meaning. Inference making and reading comprehension are deeply interwoven with each other and inference making is very crucial for reading comprehension to happen. Suh and Trabasso (1993) found that when readers try comprehending the text, they would make a representation of that text which requires integration of the information across the sentences. This integration happens by the individual who reads the text, by linking the text read to the experiences and relevant knowledge. In order to comprehend the text that is read, inferences are made. Therefore it can be said that without making inferences an individual cannot understand the text or the meaning implied by the author/writer. In 1999, Cain and Oakhill investigated the relation between comprehension and Inferencing ability in 6 to 8 year old children while reading narrative stories. The study mainly investigated whether good comprehenders had a better ability to draw inferences or if the ability to draw inferences aids comprehension. They found that poor comprehenders were able to answer for literal questions, but they were not able to answer many inference related questions when compared to good comprehenders. When the poor comprehenders gave a wrong answer assistance was provided, and they were allowed to search for the correct answer. On providing assistance the children were able to correct their mistakes but were not able to do it spontaneously.

Types of Inference

There are several types of inference that an individual makes while he/she reads. Each type of inference has a different purpose in comprehending the text. Among the other types of inferences one category of inference is causal inference also known as backward inference and predictive inference also known as forward inference. This study focuses on causal inference. In order to comprehend ongoing text and to maintain coherence causal inferences are required. Making coherence is important for reading comprehension. To make causal inferences prior knowledge or experience in that respective area is required. Causal inference

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has four components namely: temporal priority, necessity, operativity, and sufficiency. Temporal priority means cause should precede the consequence (where inference has to be made). Operativity means cause should remain active when inference has to be made. Necessity means the consequence cannot happen without a prior cause and sufficiency means the presence of cause is sufficient for the presence of consequence (Millis and Graesser 1994). For example: *''Sita had aspirin. Her headache went off''*. The reader reading these sentences has to form coherence between these sentences by making a causal inference that aspirin is a medicine used to cure headache. Whereas predictive inference is where the information being read currently has to be used to make an inference on what may happen later or next, based on their world knowledge.

Factors Affecting Inferential Abilities

Ackerman in 1986 had suggested some reasons on why there is age related differences in inferential abilities. One of the factor, is younger children do not integrate much information which affects their ability in making cohesive inferences. Matthew Quirk (2002) did a study on second and third grade children's ability to make causal inferences while reading expository texts. The children had to read a set of passages aloud and after that they had to choose the appropriate inferential word among the three choices. The results of this study indicated that no causal inferences were made regardless of their age or skill.

The other factor responsible for the age related differences in making inferences is comprehension abilities. Poor comprehenders would have difficulties in making inferences. Also there are studies that indicate inferential abilities are reduced in poor comprehenders (Cain and Oakhill, 1999).

The other factors affecting inference making is prior knowledge, personal experience and memories which is also known as world knowledge. Certain types of inferences require these factors. For example, in order to infer, for digging a hole a shovel will be required, the individual should have prior knowledge or an experience of using a shovel to dig a hole. Thus he should be able to go beyond the text and make a explicit inference. Thus these all informations will be dependent on world knowledge and in young children this knowledge is developing in younger children. Thus, there are age related differences in making inferences.

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Also text recall is found to increase world knowledge. Text recall increases with age (Brown and Smiley, 1977; Mandler and Johnson, 1977).

Factors Affecting Reading Comprehension

Some of the factors affecting reading comprehension are as follows; the first factor being word decoding, has an impact on comprehension, which is if word decoding is slow and effortful then it will affect comprehension as it affects the short term memory. Decoding skills becomes better with practice and age. That is the reason for older children and adults spending less time in decoding and more time in integrating information. Vocabulary development is the second factor. Though the meaning of the word can be guessed from the contextual cues, but it may not always be helpful thus without knowing the meaning one cannot comprehend the text.

The third factor contributing is syntactic development. Syntactic knowledge is needed to find out the meaning of the syntactic construction. Implicit and explicit knowledge is required for syntactic knowledge. Willows and Ryan (1986) stated that syntactic awareness is related to decoding and reading comprehension. syntactic awareness is used to correct and recognize errors made while reading and this in turn helps in comprehension monitoring. It also aids word recognition.

The last factor important for reading comprehension is inference making. Both these components are closely interlinked and making inferences is one of the crucial components for comprehending. Kyle and Cain in 2015 compared the reading comprehension and inferential skills of hearing impaired children with normal hearing children; age matched control group and word reading matched control group and eventually with poor comprehenders. On comparison they found out that the reading comprehension of hearing impaired children are similar to those of poor comprehenders. It was found that the deaf children were able to make inferences but it was poorer when compared with the age matched control group and the word reading matched control group.

Aim of the Paper

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This study aimed to find out the ability of second and third standard children to make causal inferences while reading and compare the same of second and third standard children.

Objectives

Four objectives were formulated in this study. The first was to explore the inferential ability of second and third standard students and the second was to find if there is any difference in the inferential ability between second and third standard participants. The third objective was to find if there is any difference in the inferential ability between good readers and poor readers. The last objective of the study was to find out the differences in the performance of inferential ability between the genders.

Methodology

Materials used

Grade Level Assessment Device (Jayanthi Narayanan, 1997) was used to assess the academic performance and to group the children as good and poor readers.

To assess the inferential ability, reading passages were used. Eight passages were used for assessing the inferential ability and two passages were used for demonstration. These ten passages were adapted from a study done by Mathew Quirk in 2002. The content of these passages were modified to suit the Indian population culturally and linguistically. The modified passages had five sentences each. For each passage, three options were given to the participants to select the appropriate response. Among the three words, one word was the inferential word (the correct option); of the remaining two words, one was an associate word; and the other word an unrelated word. The passages had been field tested, by giving it to two experienced speech language pathologists (speech language pathologists with an experience of 4 to 7 years) and two teachers of class (teachers with an experience of six to seven years) two and three respectively and the modifications suggested by them for vocabulary and instructions were incorporated in the test passages. The modifications done were in terms of the nouns and grammatical structure used.

For hearing screening Graphic portable audiometer was used and hearing was screened at 40 dBHL (frequencies tested were 500Hz, 1000Hz and 2000Hz). Milestones of

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Early communication Development was used to rule out speech and language disorders. The scale enlists the development happening from birth to 18 years of age [as cited in Paul, 2007].

Procedure

This study was done to investigate the type of inferences made by second and third standard children while reading and it has been approved by the Institutional Ethics Committee (IEC) committee. This present study follows a cross sectional research design.

A total of eighty children studying in second and third standard, attending English medium matriculation regular schools were included in the study. They were selected using simple random sampling maintaining equal gender ratio. The participants were in the age range of six to nine years (79 months to 105 months). The selected participants were then divided into two groups, based on the standard they were attending. One group consisted of 40 participants studying in second standard with a mean age of 86 ± 5 months and the other group consisted of 40 participants studying in third standard with a mean age of 96 ± 6 months. All the participants were from urban matriculation schools and most of them hailed from a lower socio-economic group. Participants scoring 50% and above in their academics were only included. Participants studying in other than English medium schools, having any hearing and speech language disorders were excluded from the study.

Initially permission was sought from the principal of four urban matriculation schools. Only two schools permitted for data collection. For the selection of participants, initially hearing loss was ruled out by doing hearing screening. Children passing the hearing screening test were administered Early Communication Skills checklist to rule out speech and language disorders.

The consent was procured from selected participants using an assent form (Appendix 1) wherein, they were initially explained about the study. Following that, their demographic (such as age, parent's occupation, academic performance) details were collected (Appendix 2) by interviewing the participants and the teachers.

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Grade Level Assessment Device (GLAD) test was then administered to each participant individually to find out if the participant's ability were in the respective standard as he/she is studying at school (for example to find out if a participant studying in grade two is able to do all the tasks under the respective standard given in GLAD). The participant was considered as a good reader if he/she was able to perform the task correctly for the respective standard while the poor reader performance was one standard below the respective standard. On average good readers took 45 minutes to complete the test whereas poor readers took more time to complete the test.

After the administration of GLAD inferential ability was evaluated using the developed reading passages (Appendix 3). Initially each participant was given the example passages and instructed to read and choose the correct option. Irrespective of correct or incorrect response the participants were explained, why the selected option was correct or incorrect. Following this the printed test passages were given to the participants.

Once the participant had completed the task, the answers were analysed giving score of '1' for the correct response and score of '0' if they had selected the associate word or unrelated word. The scores were then totalled for each participant individually and a maximum score out of 8 was given. On average good readers took 30 minutes to complete the test whereas poor readers took one hour to complete the test

The raw data was collected, compiled and computed for descriptive and interpretative statistical analysis using SPSS software (Sigma plot 11.2; SPSS Inc., Chicago, IL). To find out the significant difference between the groups Pearson's chi square test was used.

Results and Discussion

In order to assess the inferential abilities four objectives were formulated. A total of 80 children had participated in the study. The age of the children ranged from 6 years to 9 years (79 months to 105 months).

The statistical analysis evaluating inferential abilities showed that none of the participants had obtained the maximum score but many participants had chosen the associate

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word (as the response) including some of the poor readers too. The maximum score obtained was 7. The results and discussion are discussed as follows;

Overall Performance of Second and Third Standard Participants

The first objective of the study was to explore the inferential ability of second and third standard students. For the purpose of analysis, mild inference group meant the participants scored 0 to 3 on the inferential ability test. Whereas moderate inference meant the participants' scored 4 to 5 on the test. And high inference meant the participants' scored 6 to 8 on the test. Figure 1 explains about the percentage of children making mild, moderate and high inferences. Only few that is 12.5% percent of the participants had made high inferences (scores ranged from 6 to 8), whereas, 51.3% of the participants made mild inference (scores ranged from 0 to 3). Moderate inference was made by 36.3% of the participants (scores ranged from 4 to 5).

The few participants who made high inferences mostly chose the association word as a response when the target response was not chosen. It was found that, half of the second and third standard population made only fewer causal inferences.

Although none of them have obtained maximum scores, but overall the results indicate that all the participants have made some amount of inferences. This finding falls in line with other studies (Paris and Lindauer, 1976; Paris, Lindauer and Cox, 1977). Paris and Lindauer (1976) did their study on first, third and fifth standard children where they asked the participant to act out the sentences, whereas Paris, Lindauer and Cox (1977) did their study on first standard children where the participants were asked to explain text in detail. Both these studies have stated that even younger children made inferences only when questioned or forced to.

The reason for fewer participants making high inference can be due to the fact that, younger children make fewer inferences and it is also not spontaneous. Younger children make inference only when they are asked to (Casteel and Simpson, 1991; Omanson, Warren and Trabasso, 1978; Paris and Lindauer, 1976; Paris and Upton, 1976). The reason attributed

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in this context can be the general teaching strategies used in schools. The teaching strategies used are less analytical.

The other reason for fewer participants making high inference can be attributed to word decoding skills. It has been stated that word decoding skills are slow and effortful in young children (Oakhill and Cain, 2003). The vocabulary development can also be a factor contributing to make fewer inferences, as vocabulary growth increases with age and experience (Werner and Kaplan, 1950). Vocabulary development is one of the best predictors for comprehension skills. If the vocabulary knowledge is limited then they would not be able to understand the meaning of that word thus making it difficult to make inferences as integration of text information cannot happen.
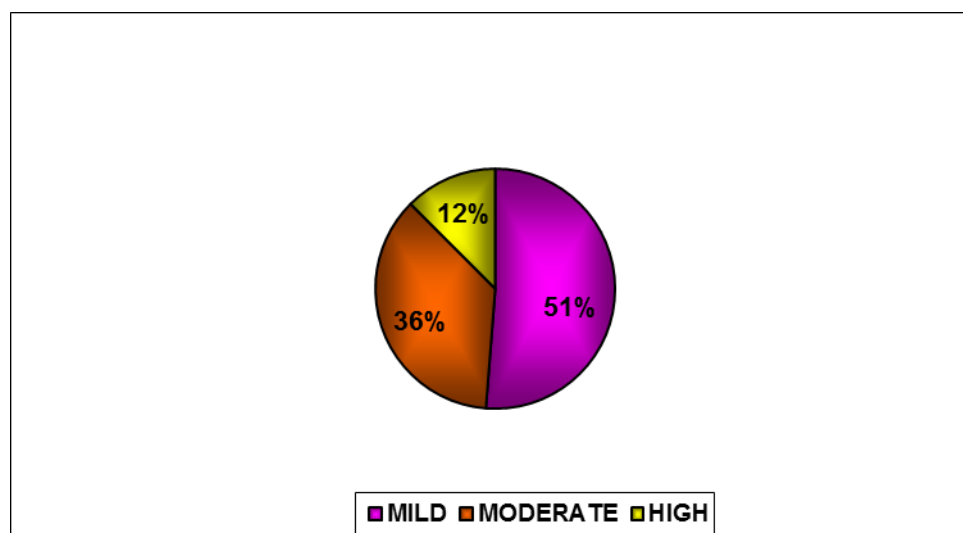
Figure 1 Overall performance of second and third standard participants

Standard Wise Performance of Inferential Ability

The second objective is to find if there is any difference in the inferential ability between second and third standard participants. Table 1 compares the inferences made by second and third standard participants. Here the scores are compared among three categories that are mild, moderate and high inference. It was found that there was no significant difference between second and third standard participants in making inferences.

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Table 1 Standard wise performance of inferential ability

			OVERALL SCORE			
			MILD	MODERATE	HIGH	Total
GRADE	II	Count	23	14	3	40
		% of Total	28.8%	17.5%	3.8%	50.0%
	III	Count	18	15	7	40
		% of Total	22.5%	18.8%	8.8%	50.0%
Total		Count	41	29	10	80
		% of Total	51.3%	36.3%	12.5%	100.0%

Even though statistically there is no significant difference but qualitatively there are differences between the standard wise performances. In the table, it is shown that high inference or more number of inferences, which is 8.8%, is made by third standard participants, whereas only 3.8% of second standard participants made high inference. Similarly the percentage of moderate inferences, which is 18.8%, made is more for third standard participant when compared to second standard which is, 17.5%. On the other hand 28.8% of the second standard participants made mild inferences but only 22.5% of third standard participants made mild inference. Though there is no significant difference among the groups but still there is a notable increase in the number of participants making high inference as the standard increases. Along with the increase there is also a decrease in the number of mild inference made by third standard participants; this indicates the number of high inferences made by them increases with the standard. This steady increase in making inference is supported by many other studies (Oakhill and Cain, 2003; Paris and Carter, 1973; Paris and Lindauer, 1976; Paris and Lindauer and Cox, 1977).

The reason for the increase in making inference with increase in grade can be due to several reasons some of which are decoding skills, vocabulary development, syntactic development, understanding text structure, identification of main ideas. It has been found that as age and experience increases decoding speed, vocabulary knowledge increases. Also children start identifying the main idea of the text and also they start integrating text and understanding the meaning of the syntactic structures in the text. These all skills help in improving inferential skill (Oakhill and Cain, 2003). Whereas the reason for absence of statistical difference between the both standards may be because the ability of immediate standards were compared that is why there were no major difference present.

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Inferential Ability in Good and Poor Readers

The third objective was to find if there are any differences in the inferential ability between good readers and poor readers. Table 2 discusses the ability of good and poor readers to make inference. Figure 2 depicts the number of good readers and poor readers in each standard. As shown below, there are 36 good readers from second standard and 32 from third standard. Regarding the number of poor readers, there are 14 poor readers from second standard and 8 from third standard.
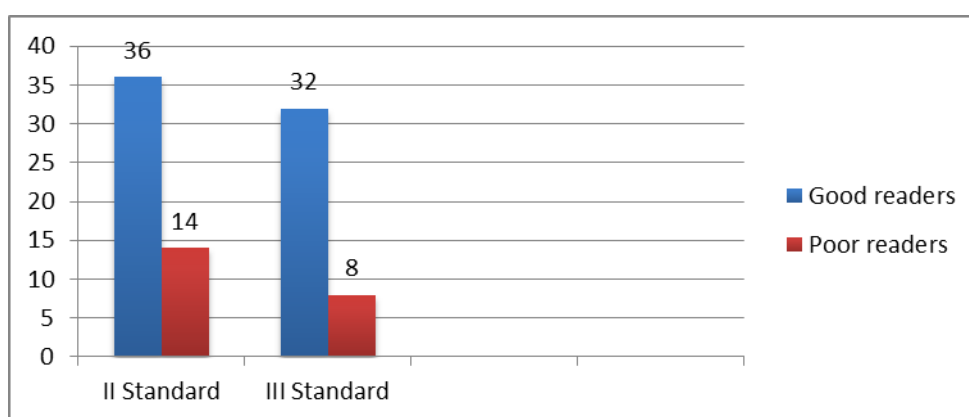
Figure 2 Number of good readers and poor readers standard wise

Table 2 compares and explains that good readers (n=59) made more number of inferences compared to poor readers (n=21). On doing Chi-Square test it was found that there is a significant difference between the groups in making inferences with a 'p' value of, < 0.05, indicating that more number of inferences was made by good readers when compared.

Table 2 Inferential ability in good and poor readers

| | | | OVERALL SCORE | | | |
			MILD	MODERATE	HIGH	Total
READER	GOOD READER	Count	20	29	10	59
		% of Total	25.0%	36.3%	12.5%	73.8%
	POOR READER	Count	21	0	0	21
		% of Total	26.3%	.0%	.0%	26.3%
Total		Count	41	29	10	80
		% of Total	51.3%	36.3%	12.5%	100.0%

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The table shows that mild inferences were made by both the groups that are 26.3% poor readers (the total population of poor readers) and 25% good readers. Also on considering academic performance, the poor readers performed poorly in their academics (as per the schools test report card) and the good readers academic performance was good (as per the schools test report card). Whereas, good readers made more number of inferences, that is 73.8%. Among the good readers, 25% of the participants made mild inferences, 36.3% of the participants made moderate inferences and only 12.5% of the participants made high inferences. Most of the good readers made moderate inferences. Thus indicating, good readers perform well when compared to poor readers.

These findings are comparable to the findings of many studies (Olson, 1985; Hansen and Pearson, 1983) which supports that poor readers make reduced inferences while reading. There are many reasons for poor reader making fewer inferences (mild inferences). One of the reasons can be slow and effortful word decoding skills which affects comprehension (Oakhill and Cain, 2003) and also if the word decoding skills are slow there will be rapid loss of information in the short term memory. The loss of information makes it difficult to integrate the first read information with the last read information in the text as they would have forgotten what was read initially. This would affect the reading comprehension (Smith, 1975). Only if the sentences read are integrated with each other, coherence inferences can be made and the text can be comprehended. Thus without good decoding, skills inferences cannot be made and thus there will be no improvement in reading comprehension and in listening comprehension too (Oakhill and Cain, 2003). The above factor may be a reason for poor readers to make fewer inferences in this study.

The other factor that may contribute in reading comprehension is syntactical knowledge and vocabulary development. Reading comprehension and vocabulary development are closely interlinked. Only when the meaning of the word is understood individuals can integrate the text and generate inferences. For good comprehension abilities, the vocabulary knowledge should also be good (Oakhill and Cain, 2003). Thus it can be suggested that poor readers would have poor vocabulary knowledge. On the contrary study by Eldredge, Quinn and Butterfield (1990) have reported that comprehension abilities improve vocabulary development.

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Gender Wise Performances in Inferential Ability

The last objective of this study was to find out the differences in the performance of inferential ability between the genders. Figure 3 compares the inferential scores between the gender groups. Even here the comparison is done in the three categories; that is mild, moderate and high inference.
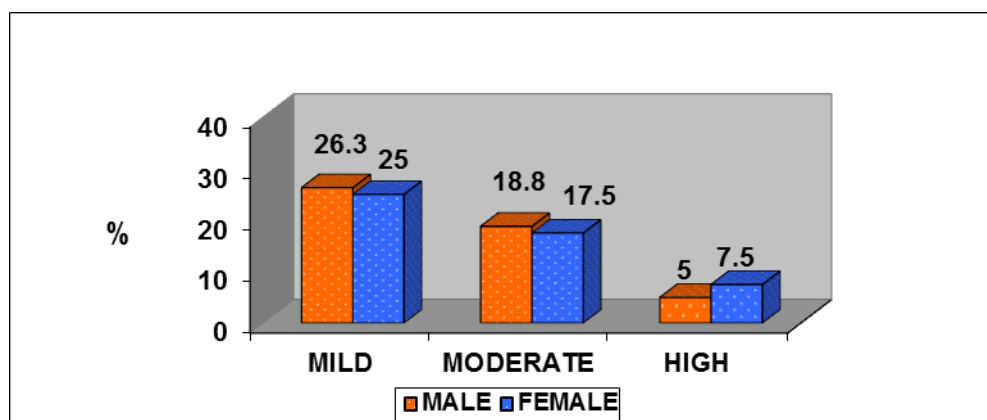
Figure 3 Gender wise performances in inferential ability

The results indicated that there was no significant difference in the scores between the genders. The figure 3 depicts that the performance across the gender are almost similar in making mild, moderate and high inference. Thus there are no differences in the performance between the groups.

Conclusion

To conclude, the present study has provided baseline data of only causal inferential ability of second and third standard children. The results suggest that good readers make more inferences compared to poor readers, thus indicating that reading skill has a major influence on making inferences while reading. It also suggests that even though statistically no significant differences were found between the performance of second and third standard children but qualitatively there is an increase in the number of inferences when the standard increases, indicating that inferential ability increases with age and with standard. The absence of statistically significant difference can be due to the fact that, inferential abilities of immediate standards were compared. It was also found that there were no differences between

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the inferential ability of boys and girls. On analysing the overall results it was found that very few participants made causal inferences and association. The unrelated word option was mostly chosen by poor readers. On the whole this study indicates that there is a need for professionals to focus on developing inferential ability for achieving competency in reading comprehension skills.

Implications

The present study has provided a detailed profile regarding the inferential abilities in second and third standard children, so this database can be used as a reference for assessment and intervention of inferential ability in higher standard children and also in disordered population. It also encourages professionals, to focus on developing strategies for improving reading comprehension skills in slow learners, children with learning disability and other language disordered population by teaching in a structured manner.

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APPENDIX 1
ASSENT FORM

- We are doing a study to learn what type of skills second and third standard children use to understand what they read. We need your help in studying about school going children like you.

- If you agree to participate in this study, I will ask you to read 10 passages and you will have to write down the answers for them. The questions asked will be related to the passage you have read out. There is no right or wrong answers because this is not a test.

- You can ask questions about this study at any time. If you decide at any time not to finish, you can ask us to stop.

- If you sign this paper, it means that you have read this and that you want to be in the study. If you don't want to be in the study, don't sign this paper.

Participant's name:_____ Date: _____

Researcher's name:_____ Date: _____

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APPENDIX 2

DEMOGRAPHIC DATA

Name:

Age/Gender: D.O.B:

Father's name: Father's occupation:

Mother's name: Mother's occupation:

Grade:

School name:

General health and associated health conditions (hearing loss, misarticulations, dysfluencies,

language problems):

Academic performance:

Language in India www.languageinindia.com **ISSN 1930-2940 15:11 November 2015**
Usha. A. Dalvi, M.Sc. Speech Language Pathology
N.S. Varsha, M.Sc. Audiology and Speech Language Pathology
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APPENDIX 1

PASSAGES FOR EVALUATING INFERENTIAL ABILITY

Every dolphin is different.	Ocean
Some are shy.	Grass
Some are naughty.	Hurt
One dolphin liked to pull the tail feathers of a pelican.	
The pelican didn't think it was funny.	

A bird's beak helps it get food and eat it.	Fly
Parrots have short, sharp beaks.	Crack
They use their beaks to open hard nuts.	Stone
Robins have small, pointed beaks.	
They use their beaks to catch worms.	

Dolphins can be smart.	Line
One day a man came to watch her.	Night
The Dolphin flipped her ring to him.	Remember
Two years later, the same man came back.	
The minute the Dolphin saw him she tossed the ring right to him.	

A baby whale cannot swim very fast.	Real
A big hungry shark is waiting for a chance to attack.	Protect
Mother whales can swim fast.	Father
When his mother sees the shark, she rushes straight at it.	
The baby whale is safe again.	

Sea otters live and sleep in the sea.	Float
They just close their eyes and go to sleep on their backs.	Ice
The water where the sea otters live is cold.	Sick
They like being in cold water.	

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They race and chase each other.

Even small bugs can be strong enough to fight their enemies.	Escape
Some of them can run or jump quickly, while others can fly away.	Bee
A bug may be able to sting enemies, or have strong jaws to bite them.	Road
Even though, lots of bugs are killed.	
Bugs are born by the thousands.	

Some spiders spin tangled webs.	Food
When an insect is trapped, the spiders quickly run to get it.	Black
Other spiders weave sheet webs.	Fast
The spider hangs upside down under the web	
When an insect enters the sheet web, the spider quickly pulls it through.	

In winters the days grow short.	Tall
The nights grow long.	Walk
Leaves have fallen from the trees.	Die
There are no berries on the bushes.	

Usha. A. Dalvi, M.Sc. Speech Language Pathology
Associate Professor
SRM Medical College Hospital and Research Centre
Kattankulathur 603 203
Kancheepuram District
Tamil Nadu
India
ushadt@yahoo.co.in

N. S. Varsha, M.Sc. Audiology and Speech Language Pathology
SRM Medical College Hospital and Research Centre
Kattankulathur 603 203
Kancheepuram District
Tamil Nadu
India
svarsh1921@gmail.com

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