

## Effects of RTI on letter naming and spelling among kindergarteners at risk for reading failure

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**Abstract.** The response-to-intervention model provides early intervention to struggling children and helps them to increase their academic achievement, as it provides immediate intervention to children who are likely to be at risk of academic failure. The purpose of this study was to investigate the effect of response-to-intervention model on developing acquisition of letter naming knowledge and spelling knowledge among kindergarteners at risk for reading failure. Thirty-six kindergarten children (Mean age= 5.03, SD=0.705; number of female children=12, and number of male children=24) identified as at risk for reading failure participated in this study. Children were administered a pre-reading skills test (developed by Mourad Ali, 2014 to screen for children who are at risk for reading failure). Children who had low achievement scores on the test (at least 1.5 standard deviations [SD] below the population mean) were included. Letter Naming Knowledge Test and Spelling Knowledge Test were employed. In order to analyze the data from the pre- and post-test, the author used two-way ANOVA analysis and t-test. Two-way ANOVA analysis and t-test results revealed the effectiveness of response-to-intervention model on developing acquisition of letter naming knowledge and spelling knowledge among kindergarteners at risk for reading failure.

**Keywords:** Response-to-intervention model, letter naming knowledge, spelling knowledge, kindergarten, reading failure

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### INTRODUCTION

Markers of language delays or deficits, difficulties in rhyming or counting, or difficulties with fine motor skills required for writing, according to DSM-5, commonly occur in early childhood before the start of formal schooling, which indicate that those children are at risk for future learning disabilities (APA, 2013). Problems with reading fluency and comprehension, spelling, written expression, and numeracy skills in everyday life typically persist into adulthood (Al Sawi, 2013; APA, 2013; Mohammed, 2013; Mourad Ali, 2014). Lack of interest in playing games with language sounds (e.g., repetition, rhyming), and troubles in learning nursery rhymes, among others, are symptoms that may be observed among preschool-age children (Mourad Ali, 2018; APA, 2013).

Preschool children with specific learning disorder may frequently use baby talk, mispronounce words, and have trouble remembering names of letters, numbers, or days of the week. They may fail to recognize letters in their own names and have trouble learning to count (APA, 2013; Mostafa, 2013). Kindergarten-age children with specific learning disorder may be unable to recognize and write letters, may be unable to write their own names, or may use invented spelling. They may have trouble breaking down spoken words into syllables (e.g., "cowboy" into "cow" and "boy") and trouble recognizing words that rhyme (e.g., cat, bat, hat). Kindergarten-age children also may have trouble connecting letters with their sounds (e.g., letter b makes the sound /b/) and may be unable to recognize phonemes (e.g., do not know which in a set of words [e.g., dog, man, car] starts with the same sound as "cat") (APA, 2013; Mourad Ali, 2018).

Moreover, some kindergarteners, especially those who come from disadvantaged backgrounds, when entering formal school, lag behind others in their early literacy development (David, William, Grant, Crystal & Mary, 2018), although becoming a competent reader is critical to academic achievement (Al Sawi, 2013; Greg et al., 2007)

RTI Model holds a promise for preventing the academic failure of all children while improving the procedures by which children at risk for learning disabilities are identified (Orhan, 2016). Many professional organizations and advocacy groups like the National Association of State Directors of Special Education, National Association of School Psychologists, and the National Center for Learning Disabilities (NCLD) support the Response-to-Intervention Model (RTI). They embrace RTI as a science-based practice and have made RTI knowledge and practice part of their professional expectations and advocacy (Charles and Judith, 2011). This approach can have many characteristics that give it superiority over other approaches: (a) a high quality general education program that includes universal screening procedures to identify students at risk for academic difficulties, (b) secondary intervention consisting of a standard, evidence-based treatment protocol with progress monitoring for a specified duration, and (c) tertiary intervention that is more intensive and tailored to individual student needs (Diane & Russell, 2008). This approach is a “multi-tiered model” as children move across different tiers of intervention (Kratochwill, Volpiansky, Clements & Ball, 2007).

Response-to-Intervention Model (RTI) for early reading as an alternative approach to traditional approaches used in schools is supposed to be a comprehensive schoolwide framework that is likely to identify young children at risk for experiencing reading difficulties. It provides them with evidence-based and data-informed instruction and interventions before they lag behind their peers (Carolyn, 2012). This approach aims to close the performance gap between at-risk and typically developing readers (Carolyn, 2012). When children enter kindergarten schools, they are likely to learn master letter naming knowledge and spelling knowledge (PA skills, Adel & Mostafa, 2012), phonemic decoding skills, an increasing lexicon of words (vocabulary) identifiable at a single glance (fluency), and comprehension. It is common for young children to be familiar with the alphabet before they start kindergarten years, which may come from their parents, pre-school experiences or even television programs. They, children, learn the names of most letters earlier than they learn their sounds (McBride-Chang, 1999).

O'Connor, Harty and Fulmer (2005) presented two Tiers (1 and 2) intervention to young children in kindergarten and those in Grade 1 ( $n=31$  children). Tier 1 consisted of professional development for teachers of reading. The authors focused on additional instruction that was provided as early as kindergarten for children whose achievement fell below average. Tier 2 intervention consisted of small-group reading instruction 3 times per week, and Tier 3 of daily instruction delivered individually or in groups of two. It was found that all students who received Tier 2 and about 40% of the students who were assigned to Tier 3 intervention performed in the average range in Grade 3 on measures of word reading and oral reading fluency.

Preschool programs, for many kindergarteners here in Egypt, as well as many other countries, are likely to be their first formal educational experiences. Some parents send their kids as early as age four to the Kuttab A house where children are taught by a sheikh to recite the holy Quran as well as reading, writing and doing simple mathematical operations). Those children who find it difficult to learn from these key early experiences prior to entering kindergarten, they are likely to face significant challenges learning to read. It can be indicated that the precursors for young children to master letter naming knowledge and spelling knowledge included in the kindergarten programs here in Egypt begin developing prior to formal schooling. However, children are taught in a traditional way and by, in most schools, unqualified female teachers. The failure of children to develop early reading skills that contribute to academic and social success has turned out to be a national concern (Mourad Ali, 2013). In their paper entitled “Research-based implications from extensive early reading interventions”, Wanzek and Vaughn (2007) found larger effects for reading interventions provided in the early stages of reading acquisition than for those provided in Grades 3 and higher. Although RTI holds a promise (Mourad Ali, 2018), research evaluating its effectiveness in promoting emergent literacy in preschoolers is only in the formative stages (Coleman, Buysse, & Neitzel, 2006).

As effectiveness of response-to-intervention model on developing acquisition of letter naming knowledge and spelling knowledge among kindergarten children identified as at risk for the acquisition of beginning reading is very limited, the present study contributes to the literature about response-to-intervention model by gathering data from an experimental design on the effectiveness of response-to-intervention model with this type of children.

Programs designed for early childhood here in Egypt, as well as other countries all over the world are reinforced by knowledge that learning begins before birth and that after birth, child's family members undertake their duties, roles and responsibilities as the child's most important teachers. Preschool stage may represent a window of opportunity where intervention and training are to prevent reading difficulties for many children (Carolyn, 2012).

Children who are not able to be competent in acquiring alphabet knowledge upon entry into kindergarten need explicit instruction (such as those presented in response-to-intervention model). Mastering letter identity, letter naming, and writing of letters will enable them to make successful transition to letter sounds and spellings. Letter naming plays a role in spelling development.

Targeting print knowledge, vocabulary, alphabet knowledge, phonological awareness, letter naming knowledge and spelling knowledge can promote children's readiness to schooling (Barnett, 2001, 2002; Barnett & Camilli, 2002; Garcia & Gonzalez, 2006; Healy, Vanderwood, & Edelston, 2005).

## **HYPOTHESES**

The study tries to test the following two hypotheses

H1: There will be significant statistical differences between experimental (taught with response-to-intervention model) and control (not taught with response-to-intervention model) groups in Letter Naming Knowledge Test in post-test in favor of the experimental group.

H2: There will be significant statistical differences between experimental (taught with response-to-intervention model) and control (not taught with response-to-intervention model) groups in Spelling Knowledge Test in post-test in favor of the experimental group.

## **METHODS**

A quasi- experimental, two-groups pretest-posttest design was used, where the same DV (letter naming knowledge and spelling knowledge) were measured in the two groups of children before (pretest) and after (posttest) a treatment was administered.

### **Participants**

Thirty-six kindergarten children identified as at risk for reading failure participated in this study. Those children were from two private kindergarten schools, located at Baltim, Kafr El Sheikh, Egypt, namely Basel School and Sanable School. The total number of children enrolled at both schools (KG1, and KG2) was 421 children. In each classroom, there were two teachers (Both of them were female). The researcher got the principal's consent. Children aged 5 and above (that is, KG2 children) were targeted. The female teachers showed their readiness to volunteer to participate in the study and hence they received 6 hours classroom training in response-to-intervention model for teaching letter naming knowledge and spelling knowledge. Both teachers in each classroom were asked in an interview with the researcher to nominate children who exhibited poor letter naming spelling knowledge and are likely to be need to additional instruction with different method (such as response-to-intervention model). Then children were administered a pre- reading skills test (developed by Mourad Ali, 2014 to screen for children who are at risk for reading failure). Children who had low achievement scores on the test (at least 1.5 SD below the population mean (APA, 2013, p.70; Mourad Ali, 2018, p.109) were included. Then Letter Naming Knowledge Test and Spelling Knowledge Test were administered (pre-test). Experimental Group (n=18) was trained using response-to-intervention approach, while the Control Group (n=18) did not participate in such training.

## Instruments

**Letter Naming Knowledge Test:** This test was developed specifically for this study. The aim of this test was to determine the children's ability to name the letters of the Arabic alphabetical system, which contains 28 letters. In addition to the alphabetical order, linguists have developed other character arrangements that include different criteria: a) In alphabetical order, which was based on the origins of the letters, as it was divided into twenty-two sublime characters, namely: (أ، ب، ج، د، هـ، و، ز، ح، ط، ي، ك، ل، م، ن، س، ع، ف، ص، ق، ر، ش، ت) b) In addition to six Arabic characters called al-Rawadif, they are: (ث، خ، ذ، ض، ظ، غ) (See Figure 1)



FIGURE 1. The Arabic alphabetical system



First children are provided with cards for the 28 letters, a card for each individual letter printed in organized order. Children then read aloud each letter, without assistance from the teacher. The child must say the name of the letter correctly to gain a point. While each child is reading the teacher records any letters read incorrectly or omitted by the child. First the twenty-two sublime characters, and then six Arabic al-Rawadif characters. The child's score is the number of letters out of 28 that were read correctly. Cronbach's  $\alpha = .876$  was obtained for the test.

**Spelling Knowledge Test:** This test was developed specifically for this study. The aim of this test was to measure the child's knowledge of letter-sound correspondences. The test consists of 8-three letters words (كسر، قرأ، سمك، شجر، قطة، فرس، هرم) It is administered to groups of children using paper and pencil. The teacher models an example word on the board using a think-aloud strategy. Then she writes the letter corresponding to each sound in the word. After that, the teacher pronounces aloud the targeted word, followed by a sentence using that word, where the teacher pronounces the word again. Examples of cards used are as follows

رَ	سَ	كَ
رَر	سَس	كَك
كَسَرَ		

تَ	بَ	نَ
تَت	بَب	نَن
نَبَتَ		

أَ	رَ	قَ
أَ	رَر	قَا
قَرَأَ		

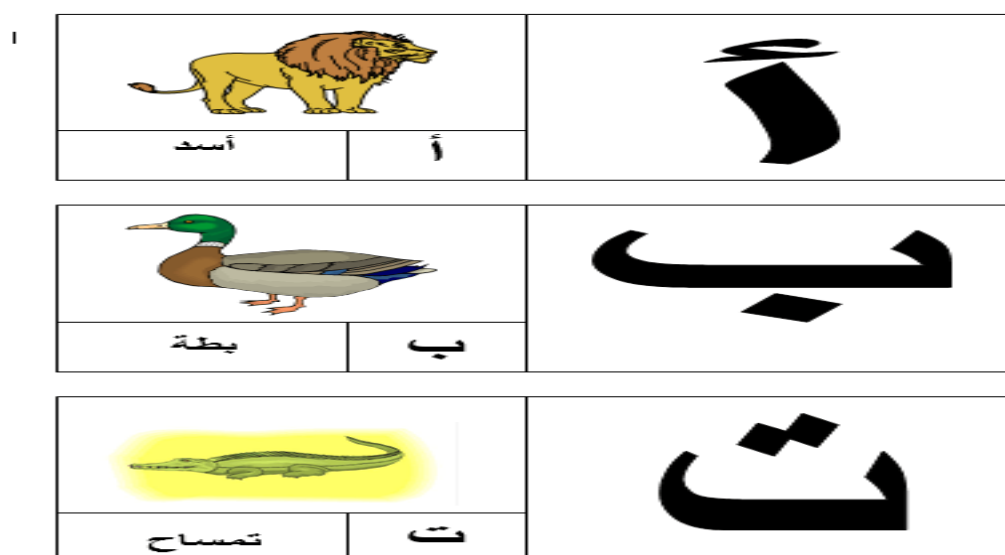
To determine a score each of the eight words is graded on a scale ranging from 0 to 3 on each word, that is, each correctly pronounced letter in the word gets one point, if incorrectly pronounced, it gets 0. The total score of the test ranges from 0-24 scores. Cronbach's  $\alpha = .894$  was obtained for the test.

## DATA ANALYSIS

The author analyzed the data using two-way ANOVA analysis and t-test.

## PROCEDURE

Before the delivery of the program to children, the four female teachers (who taught Sanable school children as the experimental group) were given 5 hours training on Tier 2 Intervention. During training, the teachers had an explanation of the program, a description of the lessons that will be taught, and an explanation of procedures for Tier 2 Intervention. They were given time to practice the initial lessons. They also were asked to teach those children who were identified as at risk for the acquisition of beginning reading in the same classroom after school (The author was given consents from parents, principal and the teachers themselves). Training sessions occurred for three days per week for 30 minutes per session across 7 weeks. It was recommended that Tier 2 intervention be provided three to five times per week for 20 to 40 min (Carolyn, 2012). The classroom teachers taught the lessons using Tier 2 intervention. Normally, children were sit on tables in groups (4-5 children in each group). This is consistent with the Tier 2 intervention program as it was found that Tier 2-type interventions were as effective when delivered in groups of two or three as when delivered individually (Iversen, Tunmer & Chapman, 2005). The researcher met weekly with the teachers to discuss children's progress and to practice the teaching scripts for the following week. The teachers used explicit, systematic teaching procedures and strategic instruction were teach letter naming knowledge and spelling knowledge to children. Each session contains six components: the teacher showed children a set of cards with letters, pictures and words on them. The child was required to know the letter. The teacher encouraged each child to know the letter, showing him/her the picture and pronounced the whole word (e.g. What is the first letter of....).



After that, she explicitly said the purpose of each teaching activity in order to encourage children understand what was being learnt (e.g. It is important to know the names, of the letter). The teacher serviced as a model. This gave children the opportunity to understand the skill being taught, and gave the teacher the opportunity to demonstrate the skills itself (e.g. the teacher speaks to the picture on the card. well, I am .....My first letter is....). She employed brisk pace, error correction, and allowed children to respond. After modeling, guided practice was given. An opportunity was given for the children to practice letter naming and spelling taught

that day with feedback from the teacher. The teacher checked for understanding, making sure that each child understands the activity and then guided practice components were repeated if necessary, so that each child would have sufficient practice. Finally, during closure, the teacher summarized the key points practiced in each session (e.g. “well, today we have learned about letter naming and how to spell words. Really you all were good. Thank you everyone for working so hard “). Then, homework was given.

## RESULTS

To test the first hypothesis, the researcher used ANOVA analysis for the differences in post- test mean scores between experimental and control groups in Letter Naming Knowledge Test. The abbreviated analysis of variance output is shown in Table 1. T-Test results for the differences in post- test mean scores experimental and control groups in Letter Naming Knowledge are shown in Table 2. Table 1 reported that  $F(1, 33)=804.699, p<.05$ . Furthermore, Table 2. Shows T-Test results for the differences in post- test mean scores between experimental and control groups in Letter Naming Knowledge. As shown,  $T=24.89, p<0.01$ . (See Figure 2 for the differences in mean scores on Letter Naming Knowledge).

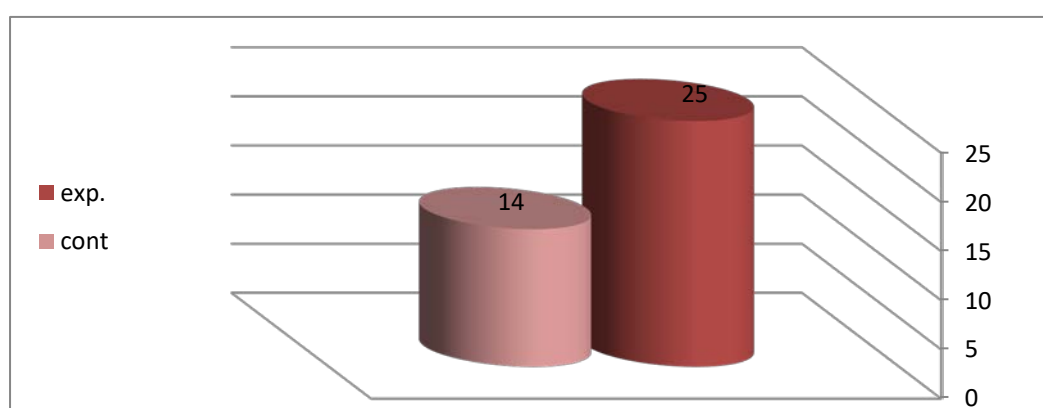
**Table1.** Tests of between-subjects effects. dependent variable: Letter Naming Knowledge (posttest)

Source	Type III Sum of squares	df	Mean square	F	P.
Pre	17.236	1	17.236		
Group	1281.220	1	1281.220	804.699	.000
Error	52.542	33	1.592		
Total	1341.889	35			

a. R Squared=.961(Adjusted R Squared=.958)

**Table 2.** T-Test results for the differences in post-test mean scores between experimental and control groups in Letter Naming Knowledge

Group	n	Mean	SD	t	p.
Experimental	18	25.88	1.13	24.89	.000
Control	18	14.00	1.68		



**FIGURE 2.** Experimental and control groups mean scores on Letter Naming Knowledge in post- test

As for the second hypothesis, the researcher used ANOVA analysis for the differences in post- test mean scores between experimental and control groups in Spelling Knowledge Test. The abbreviated analysis of variance output is shown in Table 3. T-Test results for the differences in post- test mean scores experimental and control groups in Spelling Knowledge are shown in Table 4. Table 3. reported that  $F(1, 33)=337.569, p<.0005$ . Furthermore, Table 4 shows T-Test results for the differences in post- test mean scores between experimental and

control groups in Spelling Knowledge. As shown,  $T=18.66$ ,  $p < 0.01$ (See figure 3 for the differences in mean scores on Spelling Knowledge).

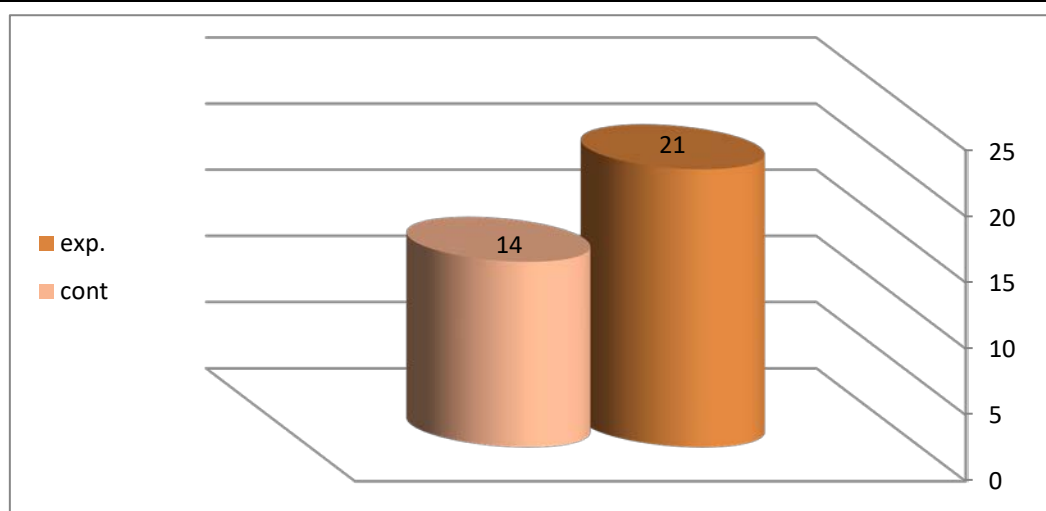
**Table 1.** Tests of between-subjects effects dependent variable: Letter Naming Knowledge (post-test)

Source	Type III Sum of squares	df	Mean square	F	P
Pre	.967	1	.967		
Group	495.326	1	495.326	337.569	.000
Error	48.422	33	1.467		
Total	555.639	35			

a. R Squared = .913 (Adjusted R Squared = .908)

**Table 4.** T-Test results for the differences in post- test mean scores between experimental and control groups in Spelling Knowledge

Group	n	Mean	SD	t	p.
Experimental	18	21.55	0.07	18.66	0.01
Control	18	14.05	1.55		



**FIGURE 3.** Experimental and control groups mean scores on Spelling Knowledge

## DISCUSSION and CONCLUSION

The purpose of this study was to investigate the effect of response-to-intervention model on developing acquisition of letter naming knowledge and spelling knowledge among kindergarteners at risk for reading failure. Letter naming knowledge was found to be a powerful preschool predictor of learning to read, sometimes even the best single predictor (Bruck, Genesee & Caravolas, 1997; Caravolas, Hulme & Snowling, 2001; Catts, Fey, Zhang & Tomblin, 2001).

It also was reported that letter naming knowledge in early childhood predicted initial spelling achievement (Muter et al.,1997; Pennington & Lefly, 2001; Shatil, Share & Levin, 2000) and contributed to reading children's reading achievement throughout elementary school years (Blatchford & Plewis, 1990; Kamel, 2015 ;Waleed, 2015), where they are taught how to read (Fathi & Mourad,2016).RTI approach is beneficial in early childhood as it provides children with key social-emotional and early literacy experiences , especially for those who lack these experiences and the key skills in the hope of preventing the need for special education services for language, literacy, and behavior disorders (Charles et al.,2011).

As is clear in this study, RTI approach in early childhood (specially kindergarten children identified as at risk for the acquisition of beginning reading) presumes use of evidence-based practices, and is an emerging practice with a promise that will lead to greater levels of effectiveness in teaching children reading sub-skills such as those taught in this study (e.g. letter naming knowledge and spelling knowledge). The results from this study were in the same line with those obtained by Kamps et al. (2007) who investigated the effect of three reading programs along with evidence-based direct instruction in small groups of at-risk students, using Tier 2 intervention. The programs employed were found to be strongly effective with at-risk students. Furthermore, differentiating instruction based on approaches such as of response-to-intervention model supported Linan-Thompson, Cirino & Vaughn (2007) suggestion that explicit, systematic, and intensive interventions should be provided to children who are at risk of lagging behind their same-aged peers in reading. As indicated by Charles et al. (2013) "RTI holds the promise of preventing early delays from becoming disabilities later by intervening sooner to meet children's needs" (P. 2).

Children's acquisition of literacy skills, including letter naming knowledge and spelling knowledge, represents a foundational educational milestone. RTI approach affects early education, early intervention, and early childhood. The findings of this study supported early intervention based on this approach to prevent developmental delays and challenges from becoming disabilities. Furthermore, RTI approach supports interventions that can be considered differentiating instructional interventions for children as individuals based on their educational needs (Gersten et al., 2008). In conclusion, results from this study suggested that kindergarteners at risk for reading failure who were enrolled in tier 2 of an RTI model utilized their letter naming knowledge and spelling knowledge.

### **IMPLICATIONS FOR PRACTICE**

In terms of translating research to practice, several implications from this study should be considered. First, since response-to-intervention model (Tier 2 intervention) in LNK is likely to be an important part and crucial component of instruction, teachers must determine how to integrate it into their daily schedules, as it is already a part of the data from the current response-to-intervention model literature. Duration of the intervention is a crucial component. Findings from this study supported the need to provide interventions that are at least 30 minutes long each session for at least three or four days a week and across a whole school year term, at least.

Second, children identified as at risk for the acquisition of beginning reading (the sample of this study) benefitted from the explicit, systematic instruction guided by RTI model (Tier 2 intervention) which was likely to produce positive change in their performance (Kroesbergen & Van Luit, 2003). Reading instruction can help teachers use the critical features of instruction, which include different types of representations to facilitate conceptual understanding (Miller & Hudson, 2007) to teach children who are children identified as at risk for the acquisition of beginning reading, that is the struggling children (Bryant, Smith & Bryant, 2008).

### **LIMITATIONS**

Although the results of this study showed that response-to-intervention model could be considered a possible evidence-based strategy for kindergarten children at risk for reading failure, there were some Limitations. A larger sample size in a study with an experimental design is likely to be warranted to further validate the findings. More sessions with RTI model (Tier 2) is recommended. This will give children opportunity for further practice of both letter naming knowledge and spelling knowledge. This study was limited to a certain type of children, that is, those children identified as at risk for the acquisition of beginning reading, so the results cannot be anticipated to generalize to normal children or those in other geographical areas or different backgrounds in other private or public schools. Despite these limitations, but it was noticed that children at risk for the acquisition of beginning reading were able to work independently, and could master letter naming knowledge and spelling knowledge.

## FURTHER RESEARCH

This study relied on RTI model (Tier2), measuring the acquisition of letter naming knowledge and spelling knowledge among kindergarten children at risk for reading failure. The value of this study lies in the type of kindergarteners from which data were gathered. Future research efforts could develop other sub-skills known to be important to reading such as rapid letter naming, phonics, and phonemic awareness.

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