

THE 'LINKS' BETWEEN LITERACY GROWTH: DO SOME STUDENTS BENEFIT
MORE FROM INTERVENTION THAN OTHERS?

BY

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Abstract

The purpose of the present study was to administer a program review of the LINKS after-school tutoring initiative at Salem Elementary School in Sackville, New Brunswick. The research aimed to address the effectiveness of the intervention strategy and highlight any measures that might serve as predictive factors with respect to success in the LINKS program. Eleven students were recruited for the LINKS after-school tutoring program (mean age = 92.36 months; 81.80% male). At the beginning of the LINKS program, participants were assessed by a research assistant on a series of literacy-related measures concerning phonological awareness, oral vocabulary, and spelling dictation items. At the end of the term, the tutor repeated the spelling dictation task performed prior to intervention. Each tutor performed a pre- and a post-assessment with their student on measures of sight word reading, nonsense word decoding, and spelling ability. The results revealed all literacy areas demonstrated significant improvement over the intervention period. Moreover, phonological awareness prior to intervention was a significant predictor of relative success in the LINKS program. The present study illustrates the overall benefit of including a tier-two intervention program within the general curriculum of the school system.

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The LINKS Between Literacy Growth: Do Some Students Benefit More from Intervention Than Others?

Learning disabilities are prevalent across the Canadian population. According to Statistics Canada (2006), 59.8% of Canadian children with a disability are diagnosed particularly with a learning disability; among the students travelling on a school bus, there will be at least one child with a learning disability. Learning disabilities, classified as neurological disorders, hinder fundamental processing (Learning Disabilities Association of America, 2013). The lifelong condition interferes with an individual's development of basic skills; deficits regarding basic language skills (e.g., reading and writing) represent the most common form of a learning disability. As overall academic achievement is partly indicated by an individual's ability to read, children displaying early literacy impairments are vulnerable to later difficulties with respect to success in the school system (Wackerle-Hollman, Schmitt, Bradfield, Rodriguez, & McConnell, 2015). Moreover, Lane and Mercer (1999) suggested that literacy is a foundational skill representative of a productive life, directly linked to overall impending success.

Therefore, it is highly important to identify students struggling in terms of reading and writing, prior to having respective difficulties act as barriers to their overall learning. The response-to-intervention (RTI) model is a multi-tiered approach to providing academic and behavioral support to all children within the school system (Grosche & Volpe, 2013). In an attempt to maintain inclusive learning, the RTI model provides an additional and individualized service to "at-risk" students within the framework of the general curriculum. As a preventive measure, supplemental support is implemented following the first indication that there may be a problem. The first tier of the RTI model,

pertaining to the academic domain, refers to the standard method of instruction provided to all students present within a classroom setting.

However, it is important to recognize that the universal learning approach described above may lack the ongoing degree of adapted instruction required to yield adequate progress across all students (Grosche & Volpe, 2013). Regular screening processes are used to identify individuals that would benefit from additional support beyond the classroom setting. These select students, roughly 15% of youth, are guided with respect to the second tier of the RTI model. They are provided supplementary assistance in addition to their tier-one instruction. This level of support is designed to practice relevant target skills; students are subjected to more frequent progress monitoring. Regardless of the modified learning instruction provided to tier-two students, some individuals will continue to make little progress and struggle to meet grade-appropriate requirements. Therefore, the third tier of the RTI model, applicable to approximately 5% of youth, requires an individualized approach to learning. The in-depth intervention strategy includes a detailed plan tailored to the child's individual needs. It involves an additional assessment and input from professionals (e.g., speech-language pathologist, psychologist, etc.).

The RTI model of academic programming is an imperative tool regarding the development of numerous individuals deemed overqualified to receive special education services within the school system (Grosche & Volpe, 2013). Without the support of the RTI model, several students with a less severe but persistent problem may be denied the additional support that they require; ultimately leading to a more significant gap in relation to their peers over time, a phenomenon known as the Matthew Effect (Stanovich,

1986). According to Stanovich (1986), children with strong vocabulary knowledge will enjoy reading and likely read more – leading to more developed reading and vocabulary skills. On the other hand, children with weak vocabulary knowledge will be more apt to struggle with reading and read less – further inhibiting growth on reading and vocabulary skills; in simple terms, it is the principle of ‘the rich get richer and the poor get poorer’. Furthermore, poor literacy skills impede learning across several academic areas (Lonigan, Burgess, & Anthony, 2000). Therefore, literacy intervention programs are designed to accommodate a wide range of individuals with learning difficulties, suchlike the LINKS program. The LINKS literacy program is able to provide support for “at-risk” students, meaning individuals struggling to meet appropriate grade level outcomes with respect to reading and writing.

The students who participate in the LINKS program are typically at least one year behind with regard to literacy development. The literacy program was designed by the Learning Disabilities Association of Nova Scotia (2010) in collaboration with teachers, speech-language pathologists, and psychologists. While some of the students who participate in the LINKS program may have a learning disability, no formal diagnosis is required. The ability to read is an important skill with respect to acquiring knowledge. For the purpose of promoting literacy among children with reading difficulties, the LINKS program designed an intervention initiative geared toward the development of simple reading and writing strategies; with reference to the RTI model of academic programming, the LINKS program would be deemed a tier-two intervention approach. The LINKS literacy program addresses phonological awareness, decoding and word reading, as well as spelling ability to a lesser degree.

Phonological Awareness

A distinct factor of phonological processing, known as phonemic awareness, plays a highly important role in literacy acquisition (Anthony & Francis, 2005).

Phonological awareness refers to an individual's ability to identify and manipulate sound structure at the phoneme level, the smallest unit of oral language (Vloedgraven & Verhoeven, 2009). Previous meta-analyses revealed the impact of phonological awareness on reading acquisition; it was suggested that phonological awareness had the power to predict an individual's reading ability (Bus & van Ijzendoorn, 1999; Ehri et al., 2001). Relatively speaking, individual difficulties regarding the detection and manipulation of sound patterns will result in an overall struggle with learning to read. An individual's formal reading instruction is hindered as a result of deficits in phonological awareness negatively impacting their development of orthographic representations (Schaars, Segers, & Verhoeven, 2017). Moreover, it was reported that phonological awareness led to an increased aptitude to decode unfamiliar words.

Therefore, the LINKS program incorporates two complementary activities that help facilitate the development of phonological awareness: phoneme blending and phoneme segmentation. The development of phonological awareness provides a foundational skill that is linked to later reading success (Burgoyne, Duff, Snowling, Buckley, & Hulme, 2013). For example, a child is able to apply their knowledge of phonological awareness when confronted with a novel word in print; the child will sound out the letters and blend the sounds together to determine the unknown word. As indicated by Ehri et al. (2001), phoneme blending involves combining a sequence of distinct oral sounds to form an identifiable word. The LINKS program targets phoneme

blending through an auditory activity. The tutor sequentially reads aloud the separate sounds that combine to make a word and instructs the student to identify the particular word (e.g., 'sh-oe'). The tutor would increase the level of difficulty as seen fit, gradually increasing the number of sounds within the word (e.g., 'v-o-l-u-n-t-ee-r').

Individuals typically acquire the ability to blend phonological information (phonemes into words) prior to the ability to segment phonological information (words into phonemes) of similar complexity (Vloedgraven & Verhoeven, 2009). According to Ehri et al. (2001), phoneme segmentation involves breaking apart a word by tapping out its distinct oral sounds or by designating a marker for each sound. The LINKS program targets phoneme segmentation through a tactile activity. The student is provided two distinct sets of blocks; the first set, colour A, would represent the vowel while the second set, colour B, would represent the consonant. The tutor would read a word aloud and instruct the student to represent the word using the appropriate block combination. Similar to the phoneme blending activity, the level of difficulty would increase as required.

Decoding and Word Reading

According to Ehri (2005), word decoding is a strategy used to help individuals read an unfamiliar word. The acquisition of decoding skills requires an understanding of the relationship between an orthographic unit and a phonological unit (Dessemontet, de Chambrier, Martinet, Moser, & Bayer, 2017). Word decoding involves the transformation of a written word into a sound pattern (e.g., sound out and blend a grapheme into a phoneme). The ability to apply one's knowledge of the name and the sound of an alphabetic letter to word reading is referred to as the partial alphabetic phase (Ehri, 2005).

During this phase of development, individuals are limited to boundary letters; partial alphabetic readers are more readily able to detect the first and the final letter sound. The formation of partial connections in memory relies heavily on context cues, making it difficult to decode isolated words in print.

Similar to the novice reader, a child with a reading deficit will remain in the partial alphabetic phase (Ehri, 2005). An individual with a reading disability will lack knowledge regarding the alphabetic system, resulting in difficulty with respect to decoding an unfamiliar word. The inability to develop proper grapheme-phoneme correspondence will impair overall reading potential. As suggested by Ehri (2005), individuals qualified as partial alphabetic readers are merely able to retain an incomplete representation of words in memory; the apparent failure to connect medial letters to pronunciation inhibits readers ability to segment a word into its constituent parts. Promising readers may be subjected to the partial alphabetic phase due to their lack of knowledge regarding the alphabetic system, requiring a more adequate understanding of vowel application in particular. Therefore, the LINKS program targets word decoding, largely highlighting the importance of vowel discrimination by means of phonological activities; for example, the tutor may place a series of vowel cards (e.g., ‘a_e’) down on the table, select one consonant card, and instruct the student to blend the consonant sound onto each vowel.

It is widely accepted that phonological awareness and word decoding are fundamental skills with respect to learning to read. The ability to segment a written word into its phonetic pronunciation will mark an individual’s transition from the partial alphabetic phase to the full alphabetic phase (Ehri, 2005). The full alphabetic phase, also

known as automatic reading, refers to a reader's ability to recognize a word by sight as a result of their developed connections relating an alphabetic letter to a phoneme.

According to Share (1995), the print-to-sound translation, otherwise known as phonological recoding, illustrates orthographic representations acquired by means of self-teaching mechanisms; moreover, word reading is greatly linked to phonological awareness and decoding ability, it is not a result of memorization. Nonetheless, reading a word known by sight, suggesting that the word's identity is triggered rapidly, indicates that the word is recognized as a whole unit rather than a sequence of distinct letters. As stated by Ehri (2005), individuals with a reading disability have difficulty identifying a word as a single unit and resort to reading individual word parts.

According to Ehri (2005), a reader's sophisticated knowledge of the alphabetic system will permit them to acquire vocabulary words more readily. As sight words become more represented in memory, an individual is able to read at a quicker rate with greater accuracy. Therefore, there is a significant advantage to reading a word by sight versus decoding an unfamiliar word. The LINKS program targets fluency building through the application of sight word cards. The tutor would initially review the level-appropriate sight word cards with the student. The tutor would later read the sight words and ask the student to imitate their pronunciation; next, they would read the sight word cards together. Once the student is familiar with the sight words, there are various fluency building games (e.g., Go Fish, timed drills) to help link the words to memory. Though the LINKS program adopted sight word practice as an approach to developing word reading, mechanisms such as Share's self-teaching theory (1995) described above, do not fully support this method of word reading as an act of memorization.

Spelling Ability

As a foundation for reading and writing, learning to spell will reinforce the development of communication skills. According to Houghton (2018), learning to spell and reading ability are linked as a result of their corresponding route with respect to phonological awareness. Therefore, a spelling assessment may help to identify skill deficits regarding a student's alphabetic knowledge; additionally, detection during the beginning stage of literacy acquisition will provide ample opportunity to implement an early intervention strategy (Clemens, Oslund, Simmons, & Simmons, 2014). However, an individual's lexicon may ultimately be a reflection of their willingness to practice with respect to phonics, as their ability to correctly spell a word is directly associated with the appropriate application of an alphabetic letter to a phoneme (Houghton, 2018). Overall, the integration of spelling instruction during the simultaneous process of guided reading will likely lead to more significant improvement (Clemens et al., 2014).

It is common for young children to play with the written code prior to being able to reliably read words (Sénéchal, Ouellette, Pagan, & Lever, 2012). Early illustrations of written language, otherwise known as invented spelling, demonstrate the nature of a child's self-guided attempt to represent words in print (Ouellette, Sénéchal, & Haley, 2013). As a result of independently playing with the writing system, invented spelling may lead to sufficient development of reading and writing skills; it is suggested that self-directed written play demonstrating a child's knowledge of language represented in print provides a significant indication of later reading success (Mehta, Ding, Ness, & Chen, 2018). Over a period of time, an individual's invented spelling practice will transition from work that is phonologically plausible yet orthographically incorrect, to word

representations that resemble correct conventional spelling (Ouellette et al., 2013).

Though prior studies had reported that invented spelling practice facilitated reading acquisition, research often neglected several key dimensions; including, the application of invented spelling in a teaching paradigm, the implication of tailored feedback with respect to self-guided writing attempts, and the inclusion of a word reading and phoneme awareness measure during the post-testing process (Sénéchal et al., 2012). Therefore, Sénéchal et al. (2012) designed a study to address these properties to varying degrees. The intervention was geared toward children deemed “at-risk” for reading difficulties. The main intervention condition was invented spelling; however, phoneme awareness lessons were provided as a comparison condition to assert that any advantage demonstrated by invented spelling was not a direct result of increased phoneme awareness alone. It was revealed that children immersed in the invented spelling condition learned to read more words than children in the comparison condition.

Overall, learning about the important nature of spelling gives rise to progressive reading development (Clemens et al., 2014). As a result of building and heavily relying on the same mental representations, spelling provides a supportive role with respect to reading. Despite the wide range of research supporting the benefit of regular spelling practice, the LINKS intervention program provides little instruction in this area. At this time, there is no spelling module present in the LINKS detailed lesson plan. However, there are some activities pertaining to spelling (e.g., applications on the iPad) that are available for the tutors to incorporate into their sessions at their own discretion.

Learning to read and write is an overwhelming process for an alarming number of students. However, a significant percent of the individual difficulties associated with

impaired literacy acquisition may be improved through an intervention strategy (Grosche & Volpe, 2013). The LINKS literacy program is a research-based, early intervention support service for elementary school-aged children; however, there are no published findings documenting the effectiveness of the LINKS response-to-intervention program. Therefore, the purpose of the present study was to administer a program review of the LINKS after-school tutoring initiative at Salem Elementary School in Sackville, New Brunswick.

The research aimed to address the overall value of the intervention strategy and highlight any measures that might serve as predictive factors with respect to success in the LINKS literacy program. The first research question addressed relative growth in the areas of phonological awareness and decoding skills, word reading, and spelling ability with respect to the LINKS program. The hypothesis stated as a result of completing the intervention program, all of the students would demonstrate improvement across all literacy areas outlined above; although, suggested growth with respect to spelling was predicted to be minimal. The second research question addressed potential key literacy areas predictive of an individual's likelihood to succeed regarding the LINKS intervention strategy; it was hypothesized that measures of age, phonological awareness, oral vocabulary, and spelling dictation would be strong indicators with respect to performance outcome. Furthermore, individuals with well-established alphabetic knowledge and phoneme awareness would uniquely benefit from the LINKS program.

Method

Participants

Eleven students participated as part of their after-school tutoring program at

Salem Elementary School in Sackville, New Brunswick. The students' grade-level ranged from one through four; the students' mean age was 92.36 months (ranging from 78 to 109, $SD = 9.36$). There were nine males (81.80%) and two females. The students were recruited for the LINKS after-school tutoring program through the recommendation of their homeroom teacher.

Materials

Phonological Awareness. The Comprehensive Test of Phonological Processing (CTOPP) was used to assess participants' skill-level regarding their phonological abilities (Wagner, Torgesen, & Rashotte, 1999). The 20-item CTOPP Sound Matching Subtest was used to measure participants' ability to select words with the same initial sound and the same final sound. The participants were assessed on a series of items resembling: "Which word starts with the same sound as *cake*? *Bike*, *coat*, or *game*?". The administrator paused for one second after pronouncing the target word, prior to pronouncing the alternative answers. The administrator pointed to the pictures as the words were pronounced. Feedback was provided on the first three test items. The administrator recorded a correct answer as 'one' and an incorrect answer as 'zero'; testing was terminated when participants reached a 'ceiling' (missed four out of seven test items). The procedure was repeated targeting the final sound segment. Similar to the preceding format, participants responded to a series of items resembling: "What word ends with the same sound as *dog*? *Dime*, *pot*, or *pig*?".

The 20-item CTOPP Elision Subtest was used to measure participants' ability to remove phonological segments from spoken words (Wagner, Torgesen, & Rashotte, 1999). For the first three test items, the administrator said a compound word and asked

participants to repeat the word. The participants were then instructed to say the word that remained after dropping one of the compound words: “Say *toothbrush*. Now say *toothbrush* without saying *tooth*”. For the remaining test items, participants were instructed to repeat a word without a specific sound: “Say *bold*. Now say *bold* without saying /b/”. Feedback was provided on the first five test items. The administrator recorded a correct answer as ‘one’ and an incorrect answer as ‘zero’; testing was terminated when participants reached a ‘ceiling’ (missed three consecutive test items).

Oral Vocabulary. The Clinical Evaluation of Language Fundamentals (CELF-5) was used to assess students’ oral vocabulary depth (Wiig, Semel, & Secord, 2013). The 40-item Word Classes Test, from the CELF-5 assessment battery, was used to evaluate participants’ ability to understand the relationship between words based on their semantic features. The administrator performed a demonstration prior to the test: “Two of these words go together. Look and listen as I say the words: *puppy, frog, dog*. The two words that go together are *puppy* and *dog*”. For the initial test items, the administrator showed participants the stimulus page and said the indicated words aloud. Following the eighth test item, participants were informed that there would be four words to choose from for the remainder of the test. Following the twelfth test item, participants were informed that there would be no pictures for the remainder of the test. Feedback was provided on all practice items. The administrator recorded the selection of both correct words as ‘one’ and selection of one or more incorrect words as ‘zero’; testing was terminated when participants reached a ‘ceiling’ (missed four consecutive test items).

Spelling Dictation. The participants’ spelling ability was assessed through a 10-item dictation task; participants were provided a blank sheet of paper to complete the

assignment. The individuals were instructed to listen to all the sounds in the word and to demonstrate their best interpretation of the word represented in print. The administrator said the word at a normal rate: “*king*”. The administrator said the target sentence at a normal rate: “The *king* sat on a throne”. The administrator repeated the word and said to participants: “Now show me how you would write that with letters”. The administrator repeated the word one final time. If the child asked for another repetition, the administrator said: “Just do your best and then I’ll say a brand-new word”. Each word was rated on a value from zero through five, five indicating correct conventional spelling. The word list is provided in Appendix A.

LINKS Measures. *Sight Word Reading*. The participants’ word reading aptitude was assessed using a sequence of sight words. The tutor presented one word at a time and asked the student to read the word aloud in a timely manner. Upon mastering sight word ‘pack one’ the student progressed to sight word ‘pack two’ and so on, up to sight word ‘pack twelve’. Each sight word pack was comprised of 25 items; sight word ‘pack one’ contained words suchlike: *the*, *are*, and *with*, whereas sight word ‘pack twelve’ contained words suchlike: *water*, *o’clock*, and *yesterday*. Each sight word pack was tested separately. The student was instructed to discontinue testing when they produced more than five errors per sight word pack; each sight word pack permitted the student to re-start with a clean slate.

***Nonsense Word Decoding*.** The participants’ word decoding ability was assessed using a nonsense word chart. The student was instructed to decode the novel word aloud by focusing on its phonetic form. Upon mastering nonsense word ‘pack one’ the student advanced to nonsense word ‘pack two’ and so on, up to nonsense word ‘pack eleven’;

while nonsense word ‘pack one’ contained unusual letter combinations suchlike: *eef*, *koy*, and *goo*, nonsense word ‘pack eleven’ incorporated novel letter blends resembling: *upe*, *om*, and *eck*. Each nonsense word pack was tested separately. The student was instructed to discontinue testing after they made three consecutive errors within a single nonsense word pack; each nonsense word pack allowed the student to continue with a fresh start.

Spelling Assessment. The participants’ spelling knowledge was measured using a word list set; participants were provided a blank sheet of paper to complete the assessment. The tutor said: “I am going to ask you to spell some words. When you do not know how to spell a word, spell it the best you can. Write down all the sounds you feel and hear”. The tutor said the word at a normal rate: “*bed*”; next, the tutor said the sentence at a normal rate: “I hoped out of *bed* this morning”, followed by pronouncing the attended word once more. The complete assessment was comprised of five distinct word list arrangements; each word list covered five words. The first word list incorporated words such as ‘*when*’, whereas the final word list included words such as ‘*confident*’; see Appendix B. The student was dismissed when they misspelled three words on a set of five words.

Procedure

The after-school tutoring program at Salem Elementary School reached out to Mount Allison University to recruit undergraduate students interested in volunteering their time to tutor through the LINKS intervention program. The tutors were required to attend a training session held by the LINKS program coordinator. The two-hour training session introduced the main components of a LINKS lesson plan: guided reading, writing, phonological skill development, and fluency building. The tutors were provided

various reading strategies to implement into their lesson as well as a wide selection of activities to structure the most successful program possible. Following the recruitment process, participants were assigned to an individual tutor.

At the beginning of the LINKS program, participants were assessed by a research assistant on a series of literacy-related measures concerning phonological awareness, oral vocabulary, and spelling dictation items outlined above. On average, the assessment lasted approximately 20-30 minutes. The participants were tested individually by a research assistant. Testing was held in a quiet room at Salem Elementary School in Sackville, New Brunswick. Testing was administered in the following order: CTOPP Sound Matching Subtest (Wagner, Torgesen, & Rashotte, 1999), CTOPP Elision Subtest (Wagner, Torgesen, & Rashotte, 1999), CELF-5 Word Class (Wiig, Semel, & Secord, 2013), and spelling dictation outlined above. At the end of the term, the tutor repeated the spelling dictation task initially performed by the research assistant prior to the intervention program.

From the start of their LINKS program, participants continued to meet with their tutor two times per week; each session lasted one hour. During this time, the tutor covered the main components associated with the LINKS program. The guided reading component lasted 15-20 minutes, around 10-20 minutes were allocated to writing, phonological skill development was addressed for 10-20 minutes, and roughly 15-20 minutes were dedicated to fluency building. Each student met with their tutor in a quiet classroom setting. The intervention program lasted roughly five to seven weeks, depending on the student's start date. Each tutor performed a pre- and a post-assessment with their student on measures of sight word reading, nonsense word decoding, and

spelling ability.

Results

Background Analyses

Descriptive statistics and intercorrelations for all variables are presented in Table 1. There was a significant, positive correlation among age and oral vocabulary; likewise, there was a significant, positive correlation among age and a child's spelling prior to intervention. Additionally, there was a significant, positive correlation among sound matching and dictation pre-intervention, dictation post-intervention, spelling post-intervention, and nonsense word decoding post-intervention. Furthermore, there was a significant, positive correlation among dictation pre-intervention and dictation post-intervention. Moreover, there was a significant, positive correlation among a child's spelling prior to intervention and dictation post-intervention, in addition to a significant, positive correlation among a child's dictation prior to intervention and spelling post-intervention. Lastly, there was a significant, positive correlation among spelling post-intervention and dictation post-intervention.

Repeated Measures Analysis of Variance

Each outcome of interest was subjected to a repeated measures analysis of variance: sight word reading, nonsense word decoding, and spelling ability. A within-subjects ANOVA was used to assess relative growth of key literacy areas across time. As illustrated in Figure 1, all areas showed significant improvement over the intervention period; therefore, supporting the hypothesis. Testing time had a significant impact on sight word reading, $F(1, 9) = 16.20, p = .003, \eta_p^2 = .643$; the effect size for this analysis suggested a medium effect. Furthermore, testing time had a significant impact on

Table 1

Descriptive Statistics and Intercorrelations Among Variables (N = 11)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---------------|--------|--------|-------|-------|--------|-------|-------|--------|------|------|-------|-------|
| 1. Age | | | | | | | | | | | | |
| 2. SM | .261 | | | | | | | | | | | |
| 3. EL | .369 | .416 | | | | | | | | | | |
| 4. OV | .851** | .278 | .168 | | | | | | | | | |
| 5. SWPr | .472 | .122 | .185 | .485 | | | | | | | | |
| 6. NWPr | .269 | .100 | .138 | .348 | .684* | | | | | | | |
| 7. SpPr | .741* | .319 | .346 | .527 | .382 | -.116 | | | | | | |
| 8. DtPr | .385 | .866** | .445 | .419 | .546 | .364 | .493 | | | | | |
| 9. SWPt | .628 | .404 | .248 | .697* | .817** | .508 | .469 | .572 | | | | |
| 10. NWPt | .393 | .643* | .286 | .228 | .107 | .191 | .083 | .239 | .419 | | | |
| 11. SpPt | .537 | .669* | .169 | .557 | .597 | .625 | .186 | .820** | .550 | .444 | | |
| 12. DtPt | .335 | .788* | .538 | .213 | .585 | .277 | .707* | .831** | .475 | .316 | .635* | |
| Mean | 92.36 | 13.73 | 6.91 | 17.73 | 2.10 | 1.30 | 3.50 | 27.73 | 3.60 | 2.30 | 4.60 | 31.00 |
| Std Deviation | 9.36 | 6.29 | 2.70 | 5.66 | 1.85 | 0.67 | 0.71 | 13.56 | 2.01 | 0.95 | 0.84 | 11.36 |
| Minimum | 78.00 | 1.00 | 2.00 | 4.00 | 1.00 | 1.00 | 3.00 | 2.00 | 1.00 | 1.00 | 3.00 | 3.00 |
| Maximum | 109.00 | 19.00 | 12.00 | 24.00 | 6.00 | 3.00 | 5.00 | 44.00 | 7.00 | 4.00 | 6.00 | 46.00 |

Note. *SM*: CTOPP Sound Matching, *EL*: CTOPP Elision, *OV*: CELF-5 Word Classes (Oral Vocabulary), *Pr*: Pre-Test, *Pt*: Post-Test,

SW: Sight Word ($n = 10$), *NW*: Nonsense Word ($n = 10$), *Sp*: LINKS Spelling ($n = 10$), *Dt*: Spelling Dictation; * $p < .05$, ** $p < .01$

nonsense word decoding, $F(1, 9) = 9.00, p = .015, \eta_p^2 = .500$; the effect size for this analysis suggested a medium effect. Lastly, testing time had a significant impact on spelling ability, $F(1, 9) = 12.24, p = .007, \eta_p^2 = .576$; the effect size for this analysis suggested a medium effect.

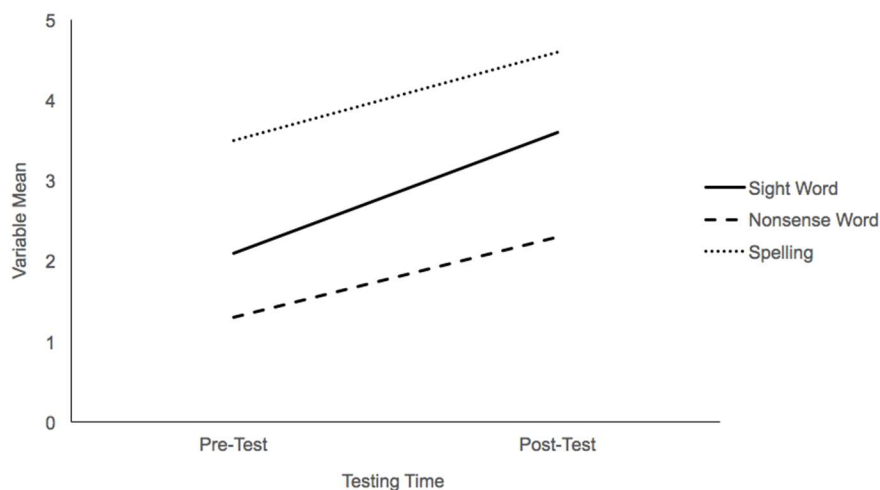


Figure 1. Representation of improvement as a factor of relative growth regarding pre-intervention performance and post-intervention performance across key literacy areas of sight word reading, nonsense word decoding, and spelling ability

Hierarchical Linear Regressions

Three hierarchical linear regressions were performed to determine whether pre-intervention measures were predictive of success in the LINKS literacy program. To assess success in the LINKS program, relative gain scores across respective outcome measures were computed by subtracting pre-intervention results from post-intervention results; these gain scores served as the response variable across distinct hierarchical linear regressions, shown in Table 2. Each hierarchical linear regression analysis implemented age as a predictor during step one and phonological awareness was added to the model

within step two. Step three incorporated oral vocabulary to the analysis; spelling dictation was the last variable added to the model in the interest of revealing its distinct impact with respect to predicting success in the LINKS program.

Table 2

Regression Analysis Representing Pre-Intervention Measures Predictive of Relative Success

| | R^2 | ΔR^2 | ΔF | β |
|----------------------|-------|--------------|------------|---------|
| Sight Word | | | | |
| 1. Age | .109 | .109 | .976 | -.719 |
| 2. PA | .239 | .130 | 1.193 | 1.192* |
| 3. OV | .354 | .116 | 1.074 | 1.085 |
| 4. Dictation | .681 | .327 | 5.118 | -.969 |
| Nonsense Word | | | | |
| 1. Age | .033 | .033 | .273 | .113 |
| 2. PA | .263 | .230 | 2.184 | 1.220* |
| 3. OV | .331 | .068 | .605 | -.080 |
| 4. Dictation | .657 | .326 | 4.750 | -.968 |
| Spelling | | | | |
| 1. Age | .005 | .005 | .041 | .808 |
| 2. PA | .109 | .104 | .816 | .216 |
| 3. OV | .237 | .128 | 1.011 | .564 |
| 4. Dictation | .269 | .031 | .215 | .301 |

Note. *PA*: Phonological Awareness (CTOPP Sound Matching and CTOPP Elision), *OV*: Oral Vocabulary (CELF-5 Word Classes), *Dictation*: Spelling Dictation Pre-Test; * $p < .05$

As seen in Table 2, participants' age was not a significant predictor of relative gain with respect to sight word reading, nonsense word decoding, or spelling. However,

phonological awareness prior to intervention was a significant predictor of success in the LINKS program for sight word reading and nonsense word decoding, providing partial support for the proposed hypothesis. Moreover, while phonological awareness remained a significant predictor of sight word reading and nonsense word decoding in the completed models, no other variable accounted for unique variance when considered together (see Table 2 for Beta values). Though including spelling dictation to the hierarchical linear regression models did not distinctly predict success in the LINKS intervention program, the considerable R^2 change values reported may reflect an impact of spelling ability not detected as significant due to the small sample size.

Discussion

The purpose of the present study was to administer a program review of the LINKS after-school tutoring initiative at Salem Elementary School in Sackville, New Brunswick. The research aimed to address the overall value of the intervention strategy and highlight any measures that might serve as predictive factors with respect to success in the LINKS program. The present study assessed relative growth of key literacy areas across time; it was revealed that measures of sight word reading, nonsense word decoding, and spelling all showed significant improvement over the intervention period. Furthermore, potential areas indicative of an individual's likelihood to prosper during a literacy intervention program were measured; age, phonological awareness, oral vocabulary, and spelling dictation were addressed to determine whether some students would benefit more from the LINKS program than others. It was revealed that phonological awareness prior to intervention was a significant predictor of success regarding the LINKS response-to-intervention program.

As predicted, completion of the LINKS intervention program resulted in significant improvement across all key literacy areas; the distinct within-subjects ANOVA revealed a medium effect size with respect to growth among all tested items. This is especially noteworthy given the low power of these analyses due to the smaller than anticipated sample size. Implemented as a tier-two response-to-intervention model, the LINKS program is designed to provide an additional service to “at-risk” students within the general curriculum of the school system (Grosche & Volpe, 2013). As previously discussed, Stanovich (1986) suggested individuals proficient in reading will read more, whereas individuals struggling to read will avoid reading; this will inevitably yield a more significant gap, pertaining particularly to alphabetic knowledge, among differing classmates long-term. Fortunately, approaches such as the LINKS program provide an added support to “at-risk” students, promoting them to work toward achieving grade-appropriate requirements. The modified method of instruction demonstrated by the overall value of the LINKS program helps struggling students to improve across areas of weakness with respect to literacy, likely diminishing the Matthew Effect over time.

Assumed to be one of the leading predictors of reading achievement among children, phonological awareness refers to an individual’s ability to identify and manipulate sound structure at the phoneme level (Vloedgraven & Verhoeven, 2009). As previously stated, development of phonological awareness is related to reading acquisition (Bus & van Ijzendoorn, 1999; Ehri et al., 2001). The current hypothesis, suggesting phonological awareness may be a strong indicator with respect to reading performance, was partially supported; the significant impact of phonological awareness on predicting reading success is consistent with prior research. According to Ehri et al.

(2001), due to the alphabetic structure of the English writing system, increased phonological awareness helps a child learn to read. The regression analyses revealed phonological awareness as a significant predictor of word decoding and word reading. This result is viable as word decoding requires phoneme blending to convert graphemes into recognizable words; furthermore, reading a word by sight requires phoneme segmentation to retain word connections in memory by pairing graphemes to phonemes (Ehri et al., 2001). In other words, limitations in phonological awareness prior to intervention may constrain a student's progress.

Beyond the known influence of phonological awareness, sight word reading is also dependent on decoding and storage of orthographic representations; therefore, prior research has indicated that an approach such as invented spelling may provide a more natural progression toward learning to read (Ouellette et al., 2013). As self-guided attempts at spelling appear prior to reading achievement, it is likely invented spelling practice promotes the development of a skill set required to read. Distinct from sight word reading, invented spelling integrates reading acquisition by means of incorporating alphabetic knowledge and phoneme awareness over time. As a result of the present general assessment regarding the LINKS intervention program, it is recommended lesson plans be modified to include a more student-directed invented spelling practice as a means of facilitating the acquisition of decoding and sight word reading skills. Research directed by Sénéchal et al. (2012) investigated a learn-to-read approach pertaining to intervention; it was revealed "at-risk" children immersed in an invented spelling condition learned to read significantly more words compared to children receiving an alternative treatment. Additionally, children participating in invented spelling practice

displayed improvement regarding their spelling ability as a result of integrating individualized feedback into their subsequent spelling attempt (see also Ouellette & Sénéchal, 2008; Ouellette et al., 2013).

It is important to acknowledge potential limitations associated with the present study. First of all, the sample was comprised of eleven elementary school-aged children. This relatively small sample size decreased the statistical power of the present study and may have hindered the likelihood of reporting significant results. Particularly, hierarchical linear regression analyses indicated spelling dictation did not distinctly predict success in the LINKS intervention program; however, a substantial amount of variance was accounted for as a result of adding a spelling measure into the linear regression models of sight word reading and nonsense word decoding. This proposed inclination may have yielded significant results permitted a larger sample size was available. Additionally, intervention was only administered for five to seven weeks total; the short timeframe may have acted as a barrier toward achieving greater literacy development.

Furthermore, the present study did not include a control group; an added condition of this nature would have allowed for a direct comparison between the general outcome of the intervention program and a group of students receiving no form of intervention. This approach was not possible as Salem Elementary School would not identify children deemed “at-risk” and withhold their participation in the LINKS intervention program, as would be needed to incorporate a suitable control group. It is possible working one-on-one with a reading tutor had a positive impact across literacy areas as a whole; however, lacking a comparison group makes it difficult to differentiate

progress uniquely attributed to improvement in a particular domain. Moving forward, this limitation may be addressed through the implementation of a multiple baseline design and/or students' staggered entry into the LINKS literacy program.

The present study illustrates the overall benefit of including a tier-two response-to-intervention program within the framework of the general curriculum. The LINKS intervention program provides “at-risk” students, struggling with respect to reading and writing, the added support to develop basic language skills. The multi-tiered approach to providing an additional service is highly important to address respective difficulties prior to having the child’s literacy deficits act as barriers to their overall learning. Despite the limited sample size, the present study revealed significant improvement in key literacy areas among students receiving intervention. Phonological awareness was found to be a significant predictor of success within the literacy program; therefore, all students may benefit from placing additional focus on this area within the regular classroom setting. Furthermore, based on trends in the present data and past research, it is recommended that invented spelling practice be promoted and included in the LINKS program as a more natural progression toward learning to read. Literacy is a foundational skill linked to impending success – an ability directly related to many aspects of a dynamic life. All individuals deserve to develop adequate reading and writing skills; therefore, future research may continue to uncover how best to help those who may be struggling in this vital area.

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Appendix A

Spelling Dictation Word List

For each word:

Say the word at a normal rate.

Say the target sentence at a normal rate.

Say the word again.

Say: “Now show me how you would write that with letters.”

Then say the word again.

If the child asks for another repetition, say: “Just do your best and then I’ll say a brand-new word”. Use a lot of encouragement to get them through this.

1. She – She is my friend.
2. King – The king sat on a throne.
3. Tree – I climbed a tree.
4. Cake – I had cake on my birthday.
5. Lick – My dog likes to lick me.
6. Back – Can you scratch my back?
7. Come – Please come here.
8. Blue – I like the colour blue.
9. Beach – I love going to the beach in the summer.
10. Island – I live on an island.

Appendix B

LINKS Spelling Assessment

Set One:

1. Bed – I hopped out of bed this morning.
2. Ship – The ship sailed around the island.
3. When – When will you come back?
4. Lump – He had a lump on his head after he fell.
5. Float – I can float on the water with my new raft.

Set Two:

1. Train – I rode the train to the next town.
2. Place – I found a new place to put my books.
3. Drive – I learned to drive a car.
4. Bright – The light is very bright.
5. Shopping – Mother went shopping at the grocery store.

Set Three:

1. Spoil – The food will spoil if it is not kept cool.
2. Serving – The restaurant is serving dinner tonight.
3. Chewed – The dog chewed up my favourite sweater yesterday.
4. Carries – She carries apples in her basket.
5. Marched – We marched in the parade.

Set Four:

1. Shower – The shower in the bathroom was very hot.
2. Cattle – The cowboy rounded up the cattle.
3. Favour – He did his brother a favour by taking out the trash.
4. Ripen – The fruit will ripen over the next few days.
5. Cellar – I went down to the cellar for the can of paint.

Set Five:

1. Pleasure – It was a pleasure to listen to the choir sing.
2. Fortunate – It was fortunate that the driver had snow tires during the snowstorm.
3. Confident – I am confident that we can win the game.
4. Civilize – They had the idea that they could civilize the forest people.
5. Opposition – The coach said the opposition would give us a tough game.