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The Effects Of An Intervention Using Pokemon Trading Card Game On The Decoding Abilities Of Children

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by

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Thank you, everyone.

- Derek D. Emmett

Abstract

The present study focuses on illustrating the relationship between word decoding instruction and word decoding abilities within the context of a trading card game. Additionally, an argument for reading motivation and improvement of literacy skills is made. Three participants between the ages of 9 and 13 were recruited for participation in this study. Several decoding strategies such as phonemic awareness and morphological awareness strategies were implemented and trained over the course of several trading card games. Performance in decoding of several lists of compiled nonwords following treatment phases were systematically measured by the researcher. Two of the three participants demonstrated positive trends in performance following treatment phases.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

A critical component in reading is phonological processing. According to Wagner and Torgesen (1987), phonological processing is the combination of three broad subcomponents which are used to manipulate and interpret words in both written and spoken forms. The three components are phonological awareness, phonological recoding in lexical access and phonetic recoding in working memory. While all three of these are vital to spoken and written language production and comprehension, this study primarily focuses on the application and underpinnings of phonological awareness and some of its own subcomponents. Phonological awareness is central to the decoding process and involves the understanding and employment of syllable segmentation, onset-rime manipulation, and phonemic awareness.

Morphological awareness is the understanding (and awareness) of the morphological structure of words and the relationship between the meanings of smaller word segments and their greater meanings at the whole-word level. Intervention focusing on morphological awareness has shown to be an effective form of remediation as demonstrated by Kirk and Gillon (2009). This study emphasizes the importance of an intervention using phonemic awareness, syllable segmentation and morphological awareness strategies.

Prevalence of Reading Disorder

The task of estimating the prevalence of reading disorder is a difficult one for a number of reasons. Kahmi and Catts (2014) suggests categorizing individuals with reading disorders involves a rather arbitrary or subjective process. Essentially, differences in qualifying individuals with reading disorders may be due to the heterogeneity of measurement instrumentation and methodologies of researchers. For instance, if the number of individuals with reading disorders is depicted along a standard bell-curve distribution along with other age-matched peers without reading disorders, where exactly should the cutoff standard deviation criteria be for individuals who demonstrate reading deficits? One standard deviation? Two standard deviations? Non-

uniform criteria for categorizing reading disorders quickly makes this a challenging undertaking. Some evidence indicates that young boys are more likely to exhibit reading difficulties as compared to young girls, though this difference has been attributed to the tendency of young boys to be more inattentive and hyperactive (Kahmi & Catts, 2014; Willcutt & Pennington, 2000).

Reading Disorder

Several competing definitions for the classification of reading disorders exist throughout historical literature. Dyslexia, which is an impairment of an individual's phonological processing and spelling is frequently overattributed to reading disorders of all types. However, this type of reading disorder fails to encapsulate other presentations of reading disorders. According to Kahmi and Catts, (2014), the consensus of researchers on the nature of reading disorder involves the recognition that reading disorders represent a deficit in the language system as opposed to some deficit of sensory or cognitive abilities. An operational definition which this study will henceforth utilize in describing reading disorders is one succinctly expressed by Denton and Mathes (2002): [reading disability is] "defined as a discrepancy between achievement and intellectual aptitude, despite adequate opportunity to learn and in the absence of sensory difficulties or cultural deprivation." (Denton & Mathes, 2002, p.185). In other words, individuals with reading disorders may demonstrate some deficit in reading skill despite other cognitive and sensory processes being intact. Moreover, reading disorders are quite diverse in nature and can vary across individuals. Some individuals may experience difficulties in one or more of the following areas: decoding, reading comprehension, word recognition, phonological awareness, and morphological awareness amongst others. Deficit in any of these areas may manifest more broadly as problems with written forms of words (i.e., print) such as comprehension, word recognition, or the ability to segment and manipulate parts of written words.

While not definitive causes for legitimate reading disorders, an individual's attention and motivation (or the lack thereof) to engage with literacy also contributes to varying degrees of

success in reading outcomes (Guthrie et al., 2009). Kahmi and Catts (2014) also discuss the importance of positive mental attitude and motivation for young readers.

Decoding

Decoding is a reader's ability to translate printed words into their corresponding verbal expressions. This involves a complex, multi-faceted process which is achieved through a series of interconnected neural and psychological processes. However, this limited definition will serve adequately as an operational definition for the purposes of this study.

The Simple View of Reading, developed by Gough and colleagues, describes two skills essential for proficient reading: decoding and linguistic comprehension. (Gough & Tunmer, 1986; Hoover & Gough, 1990). From the Simple View of Reading, the Narrow View of reading is derived and focuses primarily on the decoding aspect of reading and centralizes this as the source of reading deficit.

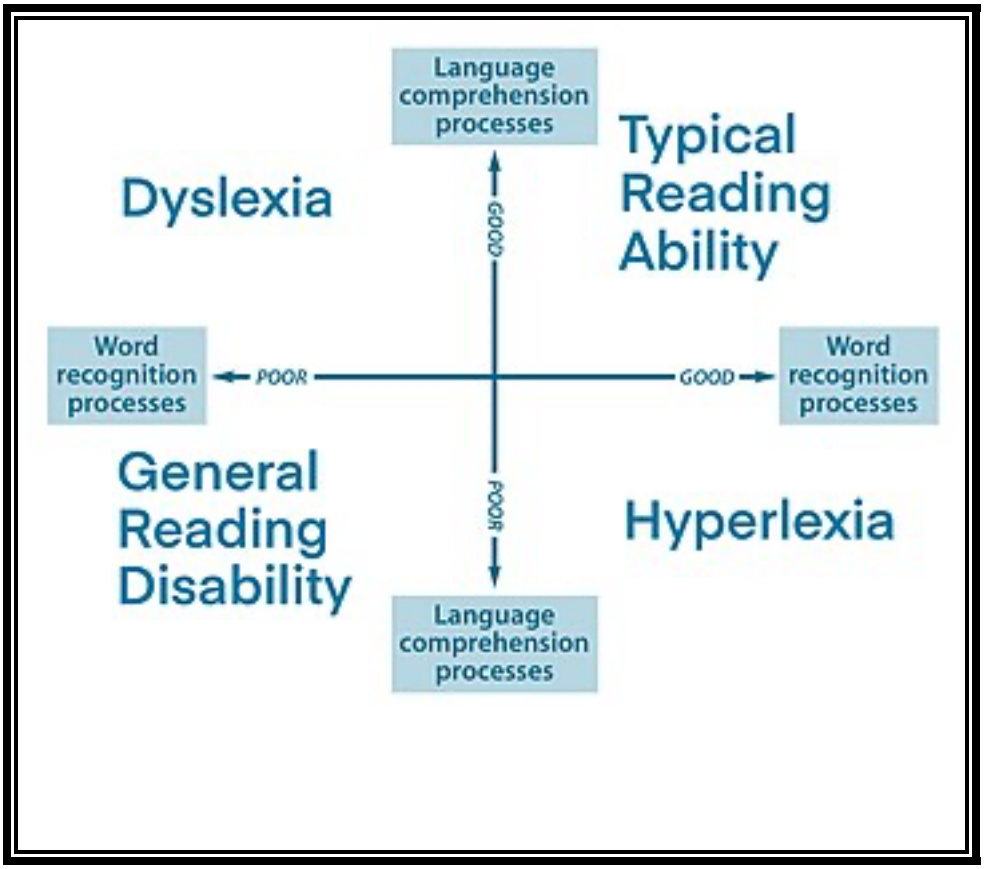


Figure 1.1: The Simple View of Reading depicted as two intersecting axes, showing four broad categories of developing readers: typical readers; poor readers; dyslexics; and hyperlexics.

Traditional Approaches to Reading Instruction

In the early twentieth century, the Orton-Gillingham Approach to reading instruction was created by Samuel T. Orton and Anna Gillingham. This approach utilizes a multi-sensory reading instruction approach involving establishing strong phoneme-to-grapheme connection. This method is commonly used in reading instruction for individuals with dyslexia. Current approaches in treating reading disorders involve considering these types of disorders from a language-oriented perspective (Kahmi & Catts, 2014). Because of this, language specialists, such as speech language pathologists, often play central roles in treatment and remediation of reading disorders.

Another approach in reading instruction is the whole-word/sight-word approach. This method involves an "anatomical" understanding of words and a recognition of the shapes of words in their complete written forms. In some cases, this may result in learning readers to simply guess at a written word rather than applying phonetic analysis of each of its smaller segments. Browder & Lalli (1991) suggest that some words in English contain phonetic irregularities and may require a whole-word memorization approach for readers to correctly achieve competent reading. Additionally, some individuals with cognitive or other physical impairments may resort to utilizing sight-word reading in order to achieve functional communication in everyday living.

Traditional approaches to reading instruction have historically yielded varying degrees of success in instructing individuals to become fluent readers. However, little is said regarding reading motivation, which is arguably one of the most critical factors in reading development.

Interventions

Phonemic awareness is a valuable tool in predicting how easily and effectively young children will learn to read. For this reason, phonemic awareness learning strategies were implemented throughout the treatment phases of the present study. These strategies primarily

involved phoneme isolation, which is the ability to recognize unique and individual sounds in words, and phoneme segmentation, which is the ability of an individual to segregate and count each present phoneme in a given word (Ehri, 2011). In a meta-analysis conducted by Ehri (2011), phonemic awareness instruction was shown to yield consistently positive outcomes in young readers across each study involved.

Novel Approaches to Reading Instruction and Motivation

Because some individuals may be less proficient in reading within the academic context, they may face intimidation and may eventually form negative associations with reading. However, reading activities which are less demanding and require less structure may serve to motivate individuals and may grant more novice readers a greater sense of agency and confidence in their engagement with literacy as compared to traditional, academic reading activities.

Zhang et al., discusses "extramural language learning" activities which individuals engage in including playing digital games, watching videos, listening to audios, reading, technology-enhanced socialization, face-to-face socialization, and writing compositions. In this review, participant motivation to engage with extramural language learning activities across studies was consistently and notably high. With this in mind, the present study aimed to engage and motivate its participants in reading activities using non-academic, "extramural" language activities.

Sundqvist & Sylvén (2014) found that participants engaged in extramural language learning activities for up to 57.2 hours per week. Indeed, these findings indicate that some merit exists in non-academic forms of reading and may additionally indicate that applying reading instruction during these types of activities may result in consistent engagement with reading along with an internal motivation to engage with different forms of literacy.

Purpose of the Study

The purpose of the current study is twofold. First, examining the use of decoding strategies to improve decoding abilities in typically developing children within the context of a game was the premier purpose of the study. Second, the researcher was interested in observing the degree to

which children may be motivated to participate in non-academic language learning activities (i.e., within the context of a game). The specific research question asked was, “What is the effect of training word decoding strategies within the context of a game on the decoding abilities of children?” It was hypothesized that children’s awareness of language conventions would become more salient and that their decoding abilities would thus be improved with explicit language instruction during and within a highly motivating environment. For some children, maintaining motivation and mental fidelity during periods of instruction can be a challenge.

Chapter 2: Method

Experimental Design

This study utilized a multiple-baselines across participants single-subject experimental design. Each participant's baseline scores served as the control over their performance during the treatment phase of the study.

Participants

Three participants between the ages of 9 and 13 were selected for participation and treatment in this study. Participant initials were used for the purposes of anonymity. The participants were GA, LB, and AC. No compensations (financial or otherwise) were allotted for time and participation in this study. Parental consent was obtained prior to beginning participation in the study. The age requirement for participation was chosen because by this age, children are ordinarily in the third grade, where their literacy skills are (typically) for the first time put to the task of "reading to learn" novel information versus "learning to read" in prior educational levels (Kahmi & Catts, pg.116) Participants were also required to be monolingual-English speakers living in the U.S./Mexico border area. Additionally, participants were required to have no formal reading or language deficits/diagnoses as reported by parents. Each participant had at least one parent employed in an educator capacity in the university where this study took place. Pertinent participant biographical information discussed in detail in following subsections.

Participant GA

At the start of participation, GA was 9 years; 8 months old male in the fourth grade. No significant educational, reading or language deficits were reported by GA's mother. Expressive and receptive language skills were observed by the researcher to be within normal functioning ranges. Cognitive functioning (i.e., attention, memory) was also observed to be within typical

parameters. A previous phonological deficit (r-gliding) was reported by the participant's mother, though /r/ distortions were not observed during baseline and treatment measures. Hearing was within normal functioning range. GA wore glasses to correct vision deficit.

Participant LB

LB was an 11-year-old male in the sixth grade at the start of participation. Parent report indicated LB was a monolingual-English speaker, however, this participant's father was a native (and dominant) Spanish speaker. LB has a history of ADHD managed by behavioral interventions, but without any documented concerns in the areas of reading or language. Hearing and vision were within normal functional ranges.

Participant AC

AC was a 12-year-old monolingual-English speaking male in the seventh grade. Hearing and vision were within normal functional ranges.

Materials

Baseline and treatment data were collected via printed-out data collection sheets/tables created by the researcher. An iPhone 12 was used by the researcher for the purposes of audio recording during post-treatment performance data. An online random nonword generator was used (*randomwordgenerator.com*) to construct the composite nonword list and its subsequent subdivisions into 10-slide PowerPoints which were used during baseline and treatment sessions. Two Pokémon Trading Card Game starter decks, "*Pokémon TCG: Lycanroc V Battle Deck"* and *"Pokémon TCG: Corviknight V Battle Deck"* along with other included items such as damage counters, metallic coins (for in-game coin tosses) were used during the intervention phases of the study. Lists of cards and their respective names are as follows:

Table 2.1. Materials

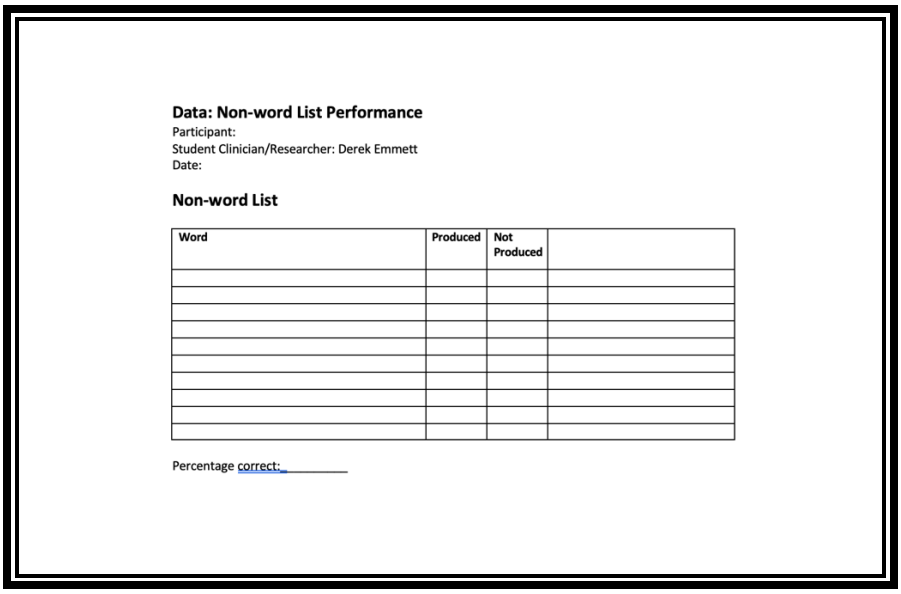
Pokémon TCG: Lycanroc V Battle Deck	***Pokémon TCG: Corviknight V Battle Deck***
DECK LIST • Lycanroc V ×1 • Dugtrio ×3 • Diglett ×4 • Galarian Sirfetch'd ×3 • Galarian Farfetch'd ×4 • Steelix ×2 • Onix ×2 • Sudowoodo ×2 • Bug Catcher ×2 • Cook ×1 • Escape Rope ×2 • Evolution Incense ×2 • Great Ball ×4 • Gym Trainer ×2 • Hop ×4 • Potion ×1 • Shauna ×2 • Sonia ×1 • Fighting Energy ×18	**DECK LIST** • Corviknight V ×1 • Galarian Perrserker ×3 • Galarian Meowth ×4 • Ferrothorn ×3 • Ferroseed ×4 • Dialga ×2 • Klefki ×2 • Cobalion ×2 • Bug Catcher ×2 • Cook ×1 • Escape Rope ×2 • Evolution Incense ×2 • Great Ball ×4 • Gym Trainer ×2 • Hop ×4 • Potion ×1 • Shauna ×2 • Sonia ×1 • Metal Energy ×18
Other materials	Other materials
• 1 ready-to-play 60-card deck • 3 reference cards • 1 rules booklet • Single-player playmat • Damage counters • 1 large metallic coin • 1 deck box • 1 Quick Guide to unlock the strategies within • 1 code card to play this deck online	• 1 ready-to-play 60-card deck • 3 reference cards • 1 rules booklet • Single-player playmat • Damage counters • 1 large metallic coin • 1 deck box • 1 Quick Guide to unlock the strategies within • 1 code card to play this deck online

Figure 2.1: Pokémon TCG: Corviknight V Battle Deck

Figure 2.2: Pokémon TCG: Lycanroc V Battle Deck

Measures and Measurement Instruments

Baseline data were collected in person by the researcher or by having parents of participants perform an audio and/or video recording of their child reading through a provided list of nonwords using smartphones and sending a digital copy of the file (via a secured university email server) to researchers for analysis and transcription. Treatment phase data collection was performed in the homes of the participants and/or in the university speech-language clinic by the researcher. Baseline and treatment phase data collection involved the use of several lists of ten non-words in Microsoft PowerPoint format. Participant decoding responses were recorded on a binary scoring table constructed by the researcher.



Data: Non-word List Performance
Participant:
Student Clinician/Researcher: Derek Emmett
Date:

Non-word List

Word	Produced	Not Produced	

Percentage correct:_____

Figure 2.3: Binary Data Collection Sheet, empty.

Procedures

Baseline measures were collected at home and audio/video recorded by parents by having each participant read three separate lists of ten nonwords in PowerPoint format out loud. Nonwords were generated via an online randomized word generator and contained words between one and five syllables. Baseline and post-treatment response values were scored using a binary scoring

system in terms of correctness of pronunciation in relation to a phonetically transcribed list of nonsense words whose pronunciations were agreed upon by volunteer students at the university.

Following baseline measures, treatment phases were initiated for each participant. Treatment phases involved the researcher and participant sitting across from each other at a table in the participant's home or university speech-language therapy clinic. The rules of the trading card game were read and explained to each participant and any questions regarding gameplay rules were answered and clarified. Once the rules of the game were established clearly, the researcher then gave the participant the deck of cards they would be using during that session. The game match (or *battle*, in the terminology of the game) was then initiated. The treatment phase was implemented throughout the match by having the participant read different examples of text on Pokémon cards. This involved Pokémon names, their corresponding "attacks", and flavor texts (miscellaneous textual information on each card's face) being read aloud by participants, while the researcher intermittently implemented different decoding strategies such as phonemic awareness, syllable segmentation, morphological awareness, etc.

Decoding Strategies

Phoneme Isolation and Segmentation

During each game, participants were periodically interrupted to implement decoding intervention. Phoneme isolation and segmentation skills were targeted by the researcher asking the participant to count and enunciate the number of unique sounds present in both real and nonwords printed on different Pokémon cards. Upon incorrect responses from participants, the researcher would halt the game and ask the participant to count and verbalize each unique phoneme in a given word while aiding them visually and gesturally with the correct count and pronunciations.

Participants were also asked to perform syllable segmentation of Pokémon names, other Pokémon "attack" names, etc. This task proved to be quite difficult and perhaps needed the most intervention across participants. When a participant incorrectly identified the number of syllables contained in a given word, the researcher would then aid the participant by clapping his hands or

knocking on the game table a number of times corresponding to the number of syllables in the word while simultaneously pronouncing each syllable.

Searching for familiar spelling patterns

Irregular phonetic spelling patterns were also asked to be identified by the participant. For example, the researcher would say: "Look at this part of the word in the word 'evolution' [*points to '-tion'*]. What sound does the 't-i-o-n' make in this word?" Incorrect responses were verbally corrected and elaborated by the researcher.

Morphological awareness

Morphological awareness strategies were integrated into games by having participants identify the presence of morphemes. This included the identification of prefixes, suffixes and base words occurring on different game cards.

Decoding by analogy

Participants were asked to look closely at a particular word selected by the researcher. After some silent visual inspection by participants, the researcher asked the participant if they could identify any "smaller" word(s) contained within the larger "whole" word. For example, the Pokémon name "Corviknight" contains the word "knight", so the participant would be asked if they could identify any familiar words in the word "Corviknight". If unable to correctly identify familiar words within larger whole words, the researcher would aid the participant visually by identifying these contained words and placing higher emphasis or verbal stress upon reading the word in its entirety.

Upon the conclusion of the game, participants were prompted to read a list of prepared, unrelated nonwords (some words containing advanced elements and a variety of syllables). Decoding skills were measured by having the participants read nonword stimuli on the researcher's laptop. As the participants read each nonword, the researcher would score participant responses as either 'produced' (correct) or 'not produced' (incorrect) on printed-out binary scoring sheets. A total percentage of correctness was calculated at the bottom of each scoring sheet.

Interrater Reliability

A university graduate student from the Speech-Language Pathology program volunteered to serve as a reliability check. A frequency ratio was drawn between the researcher and student volunteer rater's scoring of participant baseline and treatment phase performances. At least 25% of recorded data were scored by both researcher and student volunteer rater. Values from a total of nine nonword lists –each consisting of ten nonwords— across the three participants were used to construct the frequency ratio. The frequency ratio was calculated to be .84, or roughly 84% agreement.

Results

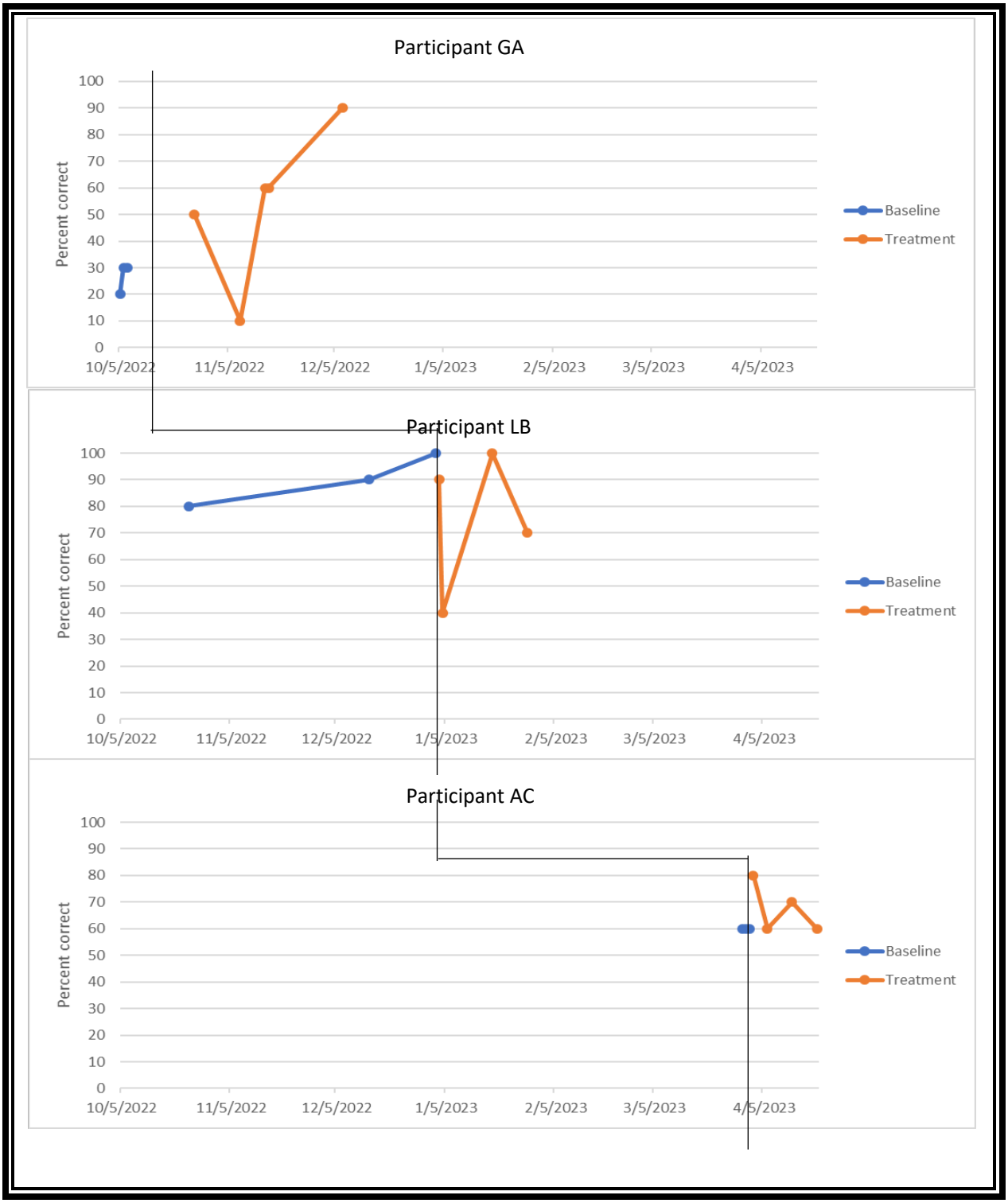

Participant GA
Percent correct
100
90
80
70
60
50
40
30
20
10
0
10/5/2022
11/5/2022
12/5/2022
1/5/2023
2/5/2023
3/5/2023
4/5/2023
Baseline
Treatment
Participant LB
Percent correct
100
90
80
70
60
50
40
30
20
10
0
10/5/2022
11/5/2022
12/5/2022
1/5/2023
2/5/2023
3/5/2023
4/5/2023
Baseline
Treatment
Participant AC
Percent correct
100
90
80
70
60
50
40
30
20
10
0
10/5/2022
11/5/2022
12/5/2022
1/5/2023
2/5/2023
3/5/2023
4/5/2023
Baseline
Treatment

Figure 3.1: Graphic representations of baseline-to-treatment phase performances across participants

Baseline values for GA were 20%, 30% and 30%. The treatment phase was initiated during subsequent games following baseline measures. GA's mean percentage of accuracy across total number of data points (baseline and treatment phase data) was: 43.75%. Mean percentage of accuracy across treatment phase was 54%. By performing visual analysis of the data represented in this graph, a clear positive trend in performance can be observed across successive data points.

Initial baseline values for LB were unexpectedly high. This is perhaps mainly due to the fact that LB was reported by parent to favor and excel in reading and writing. LB also somewhat regularly expressed frustration with having to read through nonword lists following each game. He instead wished to only play the game without having to do the "extra work" after the game was over. This can be taken as confirmation of this study's second hypothesis. Motivation to engage in this language learning activity was clearly indicated by LB's eagerness to play the game. Furthermore, LB subjectively seemed to enjoy playing the game while responding to the researcher's promptings during intervention delivery. This observation was also confirmed via a qualitative questionnaire administered to LB's parent following his participation in the study. LB's mean percentage of accuracy across total number of data points (baseline and treatment phase data) was: 81.42%. Mean percentage of accuracy across treatment phase was 75%. The decrease in performance of decoding accuracy in the second treatment session was likely due to the participant intentionally not trying to decode accurately. It was later disclosed to the researcher by the parent that LB had intentionally done so to prolong the number of times the Pokémon game would be played between LB and the researcher.

Initial baseline values for AC were 60%, 60% and 60%. AC's mean percentage of accuracy across total number of data points (baseline and treatment phase data) was: 67.28%. Mean percentage of accuracy across treatment phase was 67.5%. A slight increase in performance between baseline and treatment phases are observable in this participant's performance. Similar to

LB, AC scored relatively high across his responses. This can also be explained by AC being the eldest of the participants (12-years-old) and presence of adept literacy skills prior to his involvement in this study.

Discussion

To remind the reader, the central research question asked in this study was "what is the effect of training word decoding strategies within the context of a game on the decoding abilities of children?" The data collected indicates results that are quite variable across participants. On one hand, participant GM responded most noticeably to the treatment. On the other, participant LM did not demonstrate a significant difference between baseline and treatment phase performance. In fact, mean treatment scores were lower as compared to the mean total performance value in this participant's case. Finally, the differences between AC's baseline and treatment phase performances exhibits a nominal positive trend in performance overall with mean treatment phase performance being slightly greater than the mean total performance value. Ultimately, two of the three participants demonstrated an observable increase in decoding performance ability following implementation of treatment phase. These results are consistent with findings in previous literature on the relationship between similar decoding strategies (such as those outlined in previous sections) and participant decoding ability.

Limitations.

Several limitations were present in this study. First, several instances of non-standardization of methodological components were present throughout and potentially jeopardize the internal validity in this study. For instance, no standardized amount of time was allotted per word administered during data collection. The number of syllables in nonwords contained in stimuli lists were also not standardized, though nonwords used in these lists ranged from one to five syllables. This may be considered too broad a range of syllable number. A simple remedy to

this problem perhaps would be to simply narrow the range of syllables in each word across all stimulus items. No standardized number of interventions were implemented in each treatment session, though at least ten instances of intervention occurred during each game. Amending issues of non-standardization may, at most, serve to eliminate threat to internal validity and, at the very least, grant more uniformity of participant data and a stronger foundation for data analysis.

Aside from non-standardization, other limitations were present. Subjective performance pressure may have been experienced by participants while being prompted to read through nonword lists. This perhaps was an element which could have adversely affected participant decoding ability. A non-randomized method of selection was used to recruit participants. Probe measures to identify degree of generalization of skills gained/improved as a result of intervention were not administered, though this was due to time and scheduling constraints. The difficulty of baseline and treatment stimuli were also not individualized to account for a priori decoding ability of participants. Finally, a frequency ratio was used to calculate interrater reliability, where instead a more robust measure of interrater reliability could have been gleaned if a point-by-point analysis was used to determine which specific stimulus items were in agreement or nonagreement between raters.

Clinical Implications

Should the contents of this study be applied in the clinical setting by other speech pathologists or adherents of some other area of literacy specialization, a few articles of note should be considered. First is the context in which these methods can or rather, *should* be applied. Implementing decoding strategies within the context of game was one of the central features of this study. This justly begs the question, "can *any* game be used to achieve similar results?" By the estimation of this study, and indeed, the researcher, text-based games (such as trading card games) lend themselves better to the organic incorporation and utility of decoding strategies by participants/players. Much can be said for the potential application of similar decoding strategies in other trading card games such as *Yu-gi-oh,* and *Magic: the Gathering*, where text and nonwords

are omnipresent. One feature implicit to the Pokémon Trading Card Game is the large portion of nonwords are contained in the Pokémon creature names. These creature names are often akin to portmanteaus and may often be decoded through the use of decoding by analogy and calls upon the integration of sight-word reading and phonemic awareness skills.

One final consideration: it seems often that literacy instruction and habilitation are left to the wayside, in favor of other educational or therapeutic pursuits, though these are critical in the outcomes of several areas of life. It is important to remember that literacy is well within the scope of practice for speech pathologists and should thus receive equal focus and emphasis as other language or communication deficits.

Future Directions

Further research should be conducted with individuals in a similar age category as those in this study, however, future inclusion criteria of participants should require a diagnosis of language and/or reading disorder. By doing so, a more therapeutic effect of these and similar interventions may be observed. As previously mentioned, using a point-by-point analysis to calculate interrater reliability would provide a superior model of this measure.

Conclusion

The present study set out to answer the question of how the decoding abilities of children are affected by implementing decoding strategies within the context of the game. Upon the conclusion of treatment phases with two out of the three involved participants, observable positive trends in performance were present. The remaining one participant did not demonstrate a positive trend in decoding performance, though this was likely due to extraneous variables. Literacy undoubtedly is a requisite element in successfully functioning in variety of significant social, professional and educational circumstances. The importance of literacy instruction, rehabilitation

and habilitation should in no way be understated. The consequences of deficit in an individual's literacy capacity are far-reaching and may potentially spell the difference between desirable qualities of life and those that are comparatively challenging. This study and others like it hold essential this notion. Motivation to develop literacy is often absent for some younger individuals. This is perhaps due to an underdeveloped set of literacy skills which results in the avoidance of engagement with reading in the first place. Because of this avoidance, competency in reading and writing are thus achieved in lesser degrees. This becomes somewhat of a self-perpetuating cycle of deficient literacy abilities. As evidenced by this and more strongly by other studies, engaging and instructing novice or struggling readers in a context (such as in a text-based game) where reading is both necessary and satisfying is a viable way to sharpen literacy skills.

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Vita

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