Persisting Preschoolers: Using Storybooks to Increase Persistence on Difficult Tasks

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Abstract

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Persistence is a critical component of problem-solving and is predictive of academic achievement. Despite the crucial importance of fostering persistence during early childhood, most researchers have developed interventions for school settings (e.g., elementary and middle school) rather than formulating strategies and tools to increase persistence for early education settings (e.g., preschools and nursery centers). This dissertation investigates whether and how storybooks can be used to increase preschoolers’ perseverance (assessed via time spent attempting to complete challenging tasks). The researcher-developed books in this study demonstrate how sustained effort towards a difficult goal and the use of multiple problem-solving strategies are essential to goal-achievement despite moments of setback or failure (struggle-stories). To evaluate the effectiveness of the intervention on general perseverance, the amount of time spent on two transfer tasks (puzzle & search and find) was used to measure persistence. Findings did not detect statistically significant differences in persistence between children who simply heard struggle-stories and those who heard non-struggle narratives. Given a reading-only intervention is quite subtle for this young age group, this dissertation also explores two additional strategies used to complement the struggle-stories: roleplaying and praise. Results indicate child-led roleplaying after reading the struggle-stories was not an effective approach; however, children who heard researchers praise characters throughout each reading of the struggle narratives demonstrated statistically significant greater persistence on the transfer tasks. The implications for struggle-story development and the use of additional strategies to increase persistence at home or in the classroom are discussed.
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Loving Nest Preschool
  *Framingham, MA*

  Little Acorns
  *Framingham, MA*

  Newton Childcare Academy
  *Newton, MA*

Infant Toddler Children’s Center
  *Acton, MA*

  Magic Garden
  *Lincoln, MA*

  Pearson Street School
  *Andover, MA*

Tender Learning Centre
  *Wilmington, MA*

  Red Barn Nursery School
  *Weston, MA*

  Little Darlings
  *Mt. Laurel, NJ*

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Chapter 1: Theoretical Framework

1.1 Introduction

Persistence is frequently necessary for successful problem-solving. Regardless of whether an individual seeks out challenges or is otherwise required to complete a difficult task, perseverance can influence achievement. For example, one child may become frustrated when his or her tower keeps falling down, but continues to try different sized blocks and orientations until finally building a stable structure, while another child gives up after the initial fall and finds another game. During these difficult challenges, some children work hard and persist despite setbacks, while others tend to give up in the face of failure and miss out on pivotal learning moments. This difference in persistence has been found to be related to both academic achievements and skill development (Amari, Motlagh, Zalani, & Parhon, 2011; Gagné & St. Père, 2002; Luster & McAdoo, 1996; Steinmayr & Spinath, 2009). Given the fundamental influence of persistence on success, researchers have tried to identify the different components that drive sustained effort. Among the several cognitive and environmental factors that can influence behavior, which alternatives are able to inspire new tools or strategies and thereby increase persistence in young children?

This dissertation presents relevant theory and literature along with empirical data that explores the impact of struggle-stories on preschoolers’ persistence during challenging tasks. The first chapter will examine the importance of perseverance in early childhood and identify factors that influence the tendency towards persistence in the face of failure. It will also explore why storybooks could be an effective pedagogical tool to help children increase persistence on difficult tasks. The end of the introduction will discuss two additional manipulations of this
dissertation study, vicarious praise and roleplaying, and describe how they may enhance the effects of struggle-stories. The final chapters of this dissertation will describe the materials, procedure, and results of the present study, ending with a discussion of its key findings and limitations.

1.2 Defining Persistence and Its Importance in Early Childhood

Persistence is purposeful behavior that can be defined as the continuation of work on a particular task (Feather, 1962). Perseverance on a particular task can be driven by a combination of motivational factors, including extrinsic benefits or rewards (e.g., verbal praise, money, grades, food, or work-related promotions) (Brehm & Self, 1989; Henderlong & Lepper, 2002; Locke & Latham, 1990; Miller, Galanter, & Pribram, 1960) or internal factors, such as the joy of learning (Deci, Koestner, & Ryan, 1999) and the excitement or desire to master a new skill (Kruglanski et al., 2002; Touré-Tillery & Fishbach, 2011).

In an effort to understand the role of persistence in problem-solving and goal-achievement, researchers have utilized observational and intervention-based research experiments. Several studies have found correlations between high levels of persistence and high achievement scores (Broussard & Garrison, 2004; Gottfried, 1990; Lange & Adler, 1997), positive learning goals (Dweck & Leggett, 1988) and learning outcomes (Ryan, Connell, & Plant, 1990). Similarly, researchers have found that a lack of persistence in childhood is associated with poor academic achievement (Awam, Noureen, & Naz, 2011; Duckworth, Peterson, Matthews, & Kelly, 2007; Gottfried, 1990), ineffective learning strategies (i.e., fewer cognitive strategies, such as elaboration) (Pintrich & de Groot, 1990) and a higher likelihood of dropping out of high school (Duckworth et al., 2007).
Although the majority of persistence research focuses on older children and adolescents, researchers who measure persistent behavior in early childhood have found similar correlations between early effort and later academic outcomes. For example, a longitudinal study found that persistence at age four was related to both math and reading achievement at age seven, as well as to academic outcomes at age twenty-five. Four-year old children who were rated as highly persistent were also more likely to graduate college by the age of twenty-five than their less persistent counterparts, even after controlling for reading and math skills, vocabulary skills, gender, and maternal education level (McClelland, Acock, Piccinin, Rhea & Stallings, 2013). While persistence in this study was measured through teacher reports, rather than via behavioral measures, it still suggests there are long-lasting influences of perseverance on academic achievement. Another study recruited 263 children and their mothers to participate in three laboratory assessments to measure cognitive-linguistic skills at age three, persistence at age three (i.e., time spent on task), and academic skills at age five. Researchers found that child persistence, measured at age three, was predictive of academic skills (i.e., math and language) two years later, even after controlling for early cognitive-linguistic skills and demographic factors (Mokrova, O'Brien, Calkins, Leerkes, & Marcovitch, 2013). Additional research by Sigman, Cohen, Beckwith, and Topinka (1987) found that two-year old children who demonstrate high task persistence have been found to exhibit fewer behavioral problems and are more likely to complete tasks at the age of five than those with poor task persistence (i.e., focused for a shorter time and asked for help more quickly).

Perseverance in early childhood is clearly important for long-term academic success, but what drives differences in sustained effort in the face of challenges, and are there interventions that can boost persistence for children?
1.3 Achievement Attribution

The achievement attribution theory is derived from the idea that perceived causality of success and failure outcomes can influence persistence (Weiner, 1972). For example, a student may cite a lack of effort as the reason for why he or she did not receive a high score on a math exam and therefore study harder for the next exam. However, not all attributions have positive behavioral implications. For instance, a student may feel he or she failed a biology exam due to a lack of innate ability in the science domain and therefore forgo studying for the next exam, as he or she will never be good at biology. But what kinds of achievement attributions do preschoolers make, and are they similar to those of older children and adults?

Young children utilize both internal and external attributions to explain behavior. A review by Miller and Aloise (1989) examined what types of attributions young children (three to six years old) use to explain different behaviors. While evidence is mixed, they found children, as young as four years old, may be more likely to explain behavior (both theirs and others) with internal attributions (e.g., ability, effort) than external ones (e.g., task difficulty, luck). Further, work by Curtis and Schildhaus (1980) found four- and five-year old children preferred internal attributions to external attributions when explaining playing behavior, learning, and athletic achievement. However, other researchers found evidence to suggest external attributions were preferred to internal ones at this young age (Higgins & Bryant, 1982; Ruble, Feldman, Higgins, & Karlovac, 1979), particularly in regards to their own failure, perhaps to protect their self-esteem (Miller & Aloise, 1989). Regardless, researchers agree that preschoolers, as young as three, frequently use internal attributions to explain behavior and that the tendency to use internal attributions increases with age (i.e., three-year olds use more internal attributions than four-year
olds). These findings align with work by Frieze and Snyder (1980) who found that elementary school children were generally more likely to attribute both success and failure to internal factors than external factors and work by Nicholls and Miller (1985) who found age-related differences in achievement attributions, with younger children (K- grade 5) more likely to attribute success and failure to luck or chance, as opposed to internal reasons, relative to older children (grades 6-8).

To better understand the effects of attributions on behavior, researchers have tried to classify perceived causality across three dimensions: (i) locus (internal or external); (ii) stability (stable or unstable); and (iii) controllability (controllable or uncontrollable) (Schunk, 1982; Weiner, 1979). Locus of causality refers to whether an attribution originates from an internal (within the self) or external (outside the self) source. Internal causations include effort, ability, and fatigue; while external sources include luck or task difficulty (see Table 1 below). The stability dimension refers to the concept of whether the reason for success or failure can change over time or not. Stable causations are perceived to remain constant over time, such as innate aptitude, while unstable causations may change regularly such as mood, fatigue, or the availability of help. Weiner’s (1979) final dimension, controllability, was added based on research by Heider (1958) and Rosenbaum (1972). This dimension is concerned with the extent to which an attribution can be controlled by an individual. For example, effort is a controllable attribute, while luck is not. However, there are some fundamental issues with this third dimension. For example, can an individual perceive external attributes as controllable? Depending on perspective, task difficulty may seem uncontrollable (in the eyes of a student) or very much controllable (from a teacher viewpoint). Weiner (2010) suggests controllability can
refer to either the individual making the attribution or others in the environment; however, this
dissertation is primarily concerned with attributional dimensions from the viewpoint of the actor.

Table 1: Causal Dimensions of Attributions from the Vantage of an Actor (adapted from
Wiener, 1979). Starred attributions are controlled by others (i.e. teacher, parent), not the
individual making the attribution.

<table>
<thead>
<tr>
<th></th>
<th>Internal</th>
<th></th>
<th>External</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stable</td>
<td>Unstable</td>
<td>Stable</td>
<td>Unstable</td>
</tr>
<tr>
<td>Controllable</td>
<td>Typical Effort</td>
<td>Immediate Effort</td>
<td>Teacher Bias*</td>
<td>Help From Others*</td>
</tr>
<tr>
<td>Uncontrollable</td>
<td>Ability (Aptitude)</td>
<td>Mood (Fatigue &amp; Illness)</td>
<td>Task Difficulty &amp; School Requirements</td>
<td>Luck &amp; Chance</td>
</tr>
</tbody>
</table>

Research has shown these dimensions can impact self-efficacy, affect, expectancies, and, in turn, motivational behaviors (e.g., choice, persistence, effort) (see Figure 1 below). This dissertation is primarily concerned with how these dimensions impact expectancies for success and failure, since these expectancies have significant impact on behavior. Weiner (1979) suggests the stability dimension has the most impact on future expectancies, compared to locus of causation and controllability. His research found that when success and failure are attributed to unstable causes, individuals are more likely to expect a different result in the future than those who attribute the outcome to stable causes.

When looking at the dimensions together, however, attributions that are internal, unstable, and controllable seem to be particularly motivating, while external, stable, and uncontrollable attributions are not (Weiner, 1985). Children who use internal, unstable, and controllable attributions may exhibit greater motivation to change their behavior, work harder, or try new strategies, as they believe themselves to be the cause of an outcome that is able to be changed (Jones & Berglas, 1978; Miller & Meece, 1997; Phares, 1957; Stipek, 1996; Weiner,
1985). Similarly, research by Diener and Dweck (1978) and Dweck (1975) found that children who attributed failure to a lack of effort, rather than ability, were more likely to persist on challenging tasks by working hard, concentrating, and employing problem-solving strategies.

![Figure 1: Modified Attribution Theory Model (adapted from Weiner, 1985, 1992).](image)

On the other hand, individuals who attribute failure to external, stable, and uncontrollable attributions are more likely to experience feelings of hopelessness, helplessness, and a decrease in motivation, as they feel non-influential in an outcome that cannot be impacted (Ward & Thomas, 1985; Weiner, 1986). This decrease in motivation is also linked to a decrease in persistence. Research by Diener & Dweck (1978) and Dweck (1975) found that children who attributed failure to their innate abilities were unable to use effective problem-solving strategies and expressed negative affect towards challenges.

To better understand how to influence attributions in early childhood to increase persistence, it is first necessary to understand the factors that influence perceived causality.
1.4 Theories of Intelligence

Attribution and the perceived causation of achievement are influenced by both environmental and personal factors, such as feedback, social norms, or situational features, personal differences and beliefs, and prior experience/knowledge (Butkowsky & Willows, 1980; Kelley & Michela, 1980; Weiner, 1985, 1992) (see Figure 2 below). However, this dissertation is primarily concerned with how a child’s theories of ability, effort, and intelligence influences his or her persistence on a challenging task.

**Figure 2: Complete Attribution Theory Model (adapted from Weiner, 1985, 1992).**

As children begin to learn more about themselves and the world, they also begin to develop beliefs about how intelligence forms and functions, also known as a theory of intelligence (Heyman & Dweck, 1992, 1998; Heyman, Dweck, & Cain, 1992; Molden & Dweck, 2006). Children who view intelligence and ability as malleable (i.e., unstable) are thought to have a growth mindset or incremental theory of intelligence. Conversely, children who believe abilities cannot be altered (i.e., stable) are considered to have a fixed mindset (Dweck, 2008). These mindsets and beliefs about ability have been shown to influence attributions, where growth mindsets are more likely to lead to effort-based attributions (i.e., internal, unstable, and controllable) of failure than fixed ones (Hong, Chiu, Dweck, Lin, & Wan, 1999). Furthermore, these mindsets have been shown to have direct effects on behavior. Children with growth
mindsets are more likely to seek challenges and persevere, while those with fixed mindsets tend
to avoid challenges and decrease effort in the face of failure (Dweck & Leggett, 1988; Feather,
1962). It is estimated that approximately half of all children have fixed mindsets, which have
been linked to increased academic and performance anxiety (Cury, Da Fronseca, Zahn, & Elliot,
2008; Dweck, 2000; Dweck & Leggett, 1988), as well as aversions to and boredom from certain
tasks, despite earlier excitement (Dweck & Leggett, 1988). Given the consequences of adopting
a growth or fixed theory of intelligence on attributions, behavior, and motivation, several
researchers have explored intervention-based approaches to promoting incremental mindsets in
childhood.

1.5 Persistence-Based Interventions

Dweck and others have examined numerous kinds of pedagogical interventions to help children
evoke and develop an incremental mindset, such as providing certain types of feedback after task
completion (e.g., praise) (Henderlong & Lepper, 2002; Kamins & Dweck, 1999; Mueller &
Dweck, 1998), teaching about brain plasticity (Aronson, Fried, & Good, 2002; Blackwell, Kali,
Trzesniewski, & Dweck, 2007), modeling persistence or growth mindsets (Bandura, 1977;
Leonard, Lee, & Schulz, 2017; Rushton, 1975), or encouraging adoption of learning goals, rather
than performance goals, through guided exercises and curriculum (Dweck & Leggett, 1988;
Midgley & Urdan, 2001; Wolters, 2004). These types of interventions have varying effects;
however, overall it seems that the promotion of an incremental mindset in the right context can
have lasting impacts on a child’s learning trajectory (Sisk, Burgoyne, Sun, Butler, & Macnamara,
2018). This dissertation is primarily concerned with how environmental models can be used to
influence mindsets in early childhood.
Growth mindsets can be modeled by both real (e.g., human) and fictitious (e.g., TV or storybook characters) environmental models. In line with the social learning theory (Bandura, 1971, 1986), recent work by Leonard, Lee, and Schulz (2017) illustrated the impact of adult models on infant persistence. In their study (N= 262), 15-month-olds watched researchers model effort (struggle before succeeding on two tasks) or model success (successfully completed two tasks right away). Children who observed the researchers struggle to achieve two different goals before eventually succeeding made more attempts to achieve a novel goal than children who watched a success model or no model at all. These results suggest children, at a very young age, can learn messages from their environment and can generalize the value of persistence to novel tasks. However, the structure of this intervention poses significant scalability problems. Is it realistic to expect parents to consistently model persistence, when many of their routine tasks require little to no effort at all?

**Storybooks.** While human models may not always be an option, fictitious models in storybooks may be a more practical pedagogical intervention. Preschool children are highly familiar with storybooks, as they are ubiquitous in family homes and school environments. Between 62% and 79% of parents with children aged three- to five-years old read aloud to their children several times a week for about 30 minutes, and 91% of these children highly enjoy listening to stories (Rideout, 2017; Scholastic, 2017). Additionally, 96% of parents believe storybooks are important to their child’s intellectual development, which reflects decades of research supporting positive learning outcomes from reading aloud to children (Rideout, 2013). The combination of child-enjoyment and parental-approval are crucial factors designing effective interventions for young children, which suggests storybooks are a good pedagogical approach.
However, the long-term benefits of a storybook-based intervention hinges on the ability for young children to process, learn, and transfer information and knowledge from narratives. Researchers have examined several learning opportunities from reading storybooks, such as vocabulary and math development. Work by Eller, Pappas, and Brown (1988) explored if kindergarteners could incidentally learn vocabulary through storybooks. Experimenters read aloud two different storybooks three times over the course of a few weeks to each participant in an individual setting. After each reading, the child was prompted to retell the story in his or her own words. The combination of reading and retelling the storybooks aided a gradual increase in learning target vocabulary, despite no guided intervention or explicit definitions. Additional research on vocabulary development through storybooks has shown similar effects (Bus, van Ijzendoorn, & Pellegrini, 1995; Massaro, 2015).

Young children have also shown gains in understanding of math and science concepts after being read storybooks by parents or teachers (Casey, Erkut, Ceder, & Young, 2008; Elia, Heuvel-Panhuizen, & Georgiou, 2010; Flevares & Schiff, 2014; Kelemen, Emmons, Schillaci, & Ganea, 2014). For example, research by Holyoak, Junn, and Billman (1984) found that preschoolers could successfully complete engineering-based transfer tasks using information they learned from listening to storybooks. Even if surface-level context differed between the interventional storybooks and the post-intervention assessments, researchers found that children as young as four-years old could transfer problem-solving information to adjacent tasks.

Together, this body of research suggests that storybooks can be effective tools for teaching children content knowledge that they can apply to real-world problems. However, persistence is not task-specific, like vocabulary or engineering. While storybook research suggests preschoolers can learn non-task-specific knowledge, such as prosocial skills (Larsen,
Lee & Ganea, 2017) and emotional language (Erickson, 2018), can children glean information about persistence from storybook characters?

**Relevant Storybook Research.** Recent studies have explored how struggle-stories can be used to increase motivation and persistence among children and teenagers by modeling a growth mindset, with some success. For example, research by Lin-Siegler, Ahn, Chen, Fang, and Luna-Lucero (2016) and Hong and Lin-Siegler (2012) explored ways to improve content learning, interest, and motivation in science with high school students. By exposing adolescents to stories that highlight the failure and persistence of successful scientists, the researchers could increase students’ motivation to learn science concepts and ability to solve complex science problems. Providing students with examples of how famous scientists failed to create theories, struggled to prove hypotheses, and were simply wrong on many of their scientific ideas helped contextualize their ultimate successes and highlighted the importance of an incremental mindset. It was hypothesized that the students who read these struggle-stories would be more likely to believe the very intelligent scientists weren’t born intelligent, but rather had to work hard and learn through mistakes to achieve success. In addition, this helped narrow the perceived gap between the students and the famous scientists and encouraged the students to exhibit effort and persistence when confronted with adversity.

Furthermore, there is also evidence that struggle-stories could increase persistence in young children. Unpublished research by Master (2011) describes how personalized struggle-stories might be able to increase persistence among preschoolers. Master (2011) developed a simple story where a character learned to persist on a hard puzzle, providing the child a model of persistence, strategies for persistence, and ways to cope with failure. The stories used either an
animal, a small child, or the participant as the main character (i.e., the personalized condition). There was also a control storybook that described a child playing with a bouncy ball. After reading the child one of the four storybooks, persistence was measured through one puzzle-choice activity. In this task, the child was asked to complete a challenging puzzle, but could switch to an easier puzzle whenever he or she wanted. Using a chi-squared test of independence to assess persistence, no significant differences were found between groups (p = .085). However, when the researcher compared the personalized condition to the other three conditions, there was a significant difference in persistence (p = .016). Thus, it seems that personalized storybooks may be able to increase persistence among preschoolers via modeling and encouraging the adoption of a growth mindset.

However, there are some limitations to Master’s (2011) research. First, this research utilized storybook narratives that directly related to the research measures. The intervention stories were explicit and described a character who persists on a challenging puzzle, despite initial failure. After the story, researchers asked participants to complete a similar puzzle. Given the direct relationship between the storybook and measurement of persistence, this research was unable to explore any transfer effects. If the narrative highlighted persistence on an unrelated task, would children still demonstrate a higher level of persistence when they work on a challenging puzzle? Second, the study design only employed one measure of persistence and did not include pre-intervention measures; thus, it is unknown if persistence effects were limited to a puzzle-based activity or if there were any differences or marginal effects before the intervention in terms of persistence. Finally, even if personalized storybooks were able to increase persistence on a challenging puzzle, implementing this intervention on a wide scale would be difficult. First, parents and teachers would need to create individualized storybooks that take time, money, and
resources many schools and homes do not have. Second, using personalized storybooks would require private reading sessions with each child, rather than reading the stories in a small group setting. The present dissertation hopes to address some of these limitations and further explore implementation strategies for a storybook-based intervention.

**Implementation Strategies for Storybook Mindset Interventions.** Although the literature above suggests children may be capable of learning persistence from storybook models, combining a struggle-story with additional strategies may help children to internalize persistence and strengthen the effects of books alone. This dissertation seeks to examine both vicarious praise and roleplaying as additional interventional strategies.

**Vicarious Praise.** This dissertation seeks to explore the use of vicarious praise as a way to provide children with feedback about motivationally-charged behaviors. In other words, can praising storybook characters for their effort and use of multiple strategies to successfully solve challenging problems encourage children to adopt more effort-based attributions that help them persist in the face of failure?

In the context of social learning, observers may be more likely to imitate models who are reinforced (vicarious reinforcement), than those who aren’t (Bandura, 1965, 1971b). Vicarious reinforcement refers to the idea that a change in behavior may occur after observing the consequences of other’s behavior (Bandura, 1971b). A reinforcement can take on many forms, such as a small toy or treat, but one of the most widely used reinforcements is verbal praise (Bandura, 1971b). For instance, a teacher may praise a child for following directions, expecting other students in the class to change their behavior and follow directions. Many studies have
demonstrated the positive effects of vicarious praise on young children’s sharing behavior (O’Connor, 1969), attention (Drabman & Lahey, 1974), performance on tasks (Cheyne, 1972; Levy, McClinton, Rabinowitz, & Wolkin, 1974), aggressive behavior (Bandura, Ross, & Ross, 1963), and imitation (Rice, 1976). Bandura (1977) suggests vicarious reinforcement is a type of feedback from adults that suggest certain behavior is likely to be met with approval or disapproval. However, some researchers suggest vicarious reinforcements may not lead to long-lasting effects, particularly when the observer is never directly reinforced (Ollendick, Daily, & Shapiro, 1983; Sechrest, 1963). When a model is rewarded for a particular behavior, but the observer is not rewarded for that same behavior, the observer may experience feelings of anger, jealousy, or injustice. It may even serve as a form of vicarious punishment (Sechrest, 1963) that reduces the likelihood of the observer imitating the model.

While no researcher has explored the use of vicarious praise, specifically from an adult reader towards a storybook character, to increase motivation in children, a review by Henderlong and Lepper (2002) suggests direct praise can be beneficial to persistence. This was particularly true for studies where praise was perceived as sincere, provided realistic and attainable information about standards and expectations, and highlighted effort-based attributions of success (Henderlong & Lepper, 2002). Alongside this literature, research by Kamins and Dweck (1999) found that five-year olds who were given process praise (e.g., “you must have tried really hard”) after a task were more likely to demonstrate a higher persistence after a failure as opposed to kindergarteners who received person praise (e.g., “you’re really good at this”). That said, the use of direct praise can have a negative impact on persistence by creating pressure, encouraging social comparison, and over-justifying performance (Henderlong & Lepper, 2002). For instance, children who are praised for their effort on tasks that are perceived as easy may exhibit a
decrease in persistence and subsequently persist less on future tasks (Meyer, 1992). Direct praise is also a hard intervention strategy to scale, given its one-to-one format.

Given the success of direct process praise on persistence in children and the lack of research assessing the impact of vicarious praise on persistence, there may be positive implications to using process praise, directed at storybook characters, on preschoolers’ persistence. By praising characters for their effort and use of multiple strategies to solve problems, vicarious praise may provide children with feedback on socially acceptable and desirable behavior, while maintaining scalability and avoiding the risks of direct praise. While struggle-stories present children with models of persistence and growth mindsets, as well as encourage the adoption of effort attributions of achievement, the addition of vicarious praise may boost persistence even more than the books alone.

**Roleplaying.** Embodied cognition (i.e., roleplaying) refers to the idea that sensorimotor experiences and interaction with the physical world can enhance comprehension and conceptualization of complex concepts (Barsalou, 1999; Borghi & Cimatti, 2010; Niedenthal, 2007). Research has shown that when children use their bodies to reduce cognitive load (e.g., gestures), they are better able to create representations of concepts and perform cognitive tasks (e.g., recall) (Donald, 1993; Eerland, Guadalupe, & Zwaan, 2011). For example, recent research by Burte, Gardony, Hutton, and Taylor (2017) found that paper-folding and origami can increase spatial reasoning directly related to specific types of mathematical problems. Similar work by Jaeger, Wiley, and Moher (2016) explored how simulating an earthquake can improve learning – in their study, students who engaged in sensorimotor experiences of an earthquake (e.g., sounds, instrument measures) demonstrated significant learning gains from pre- to post-intervention.
relative to students in the control group. However, not all embodied cognition requires physical manipulatives. For instance, Smith, King, and Hoyte (2014) found that students who acted out different angles with their arms demonstrated significantly better understanding and were able to more accurately draw different sized angles on post-intervention measures compared to the non-acting control group.

Roleplaying-based interventions apply directly to storybook comprehension. Research by Glenberg, Gutierrez, Levin, Japuntich, and Kaschak (2004) found that second graders who manipulated toys or imagined manipulating toys while reading stories were more likely to recall what they had read and develop relevant text-based inferences to open-ended questions. Glenberg, Goldberg, and Zhu (2008) extended this work by demonstrating how digital manipulation can also enhance narrative comprehension. Scott, Harris, and Rothe (2001) also found significant improvements in narrative comprehension and recall when students re-enacted the story using just their bodies, compared to those who either wrote about the narrative or discussed the stories with peers.

But what about embodied cognition and perseverance? While no studies directly examine how embodiment can influence persistence compared to other intervention styles, research by Zimmerman and Ringle (1981) found positive effects on persistence when children were given the opportunity to practice persistent behavior. In this study, children first watched a model struggle to unhook two wire rings from one another for either a short period of time or a long period of time. Afterwards, children were given the opportunity to play with similar rings. A day later, participants were asked to complete a transfer persistence task. Children who watched the model try to unhook the rings for a longer period not only played with a similar set of rings for a longer time, but also worked longer on the transfer task than those who watched the model for a
short period of time. The opportunity to play with the wire rings after the model may be partially responsible for the robust transfer effects of persistence; however, given this study did not isolate the embodied approach, but simply used it as part of their intervention across all conditions, additional research is needed to understand how embodiment can influence persistent behavior through models.

The literature seems to support the idea of incorporating roleplaying in persistence interventions to help children to translate abstract concepts into concrete ideas. By practicing persistence, children may be more likely to adopt a growth mindset and attribute outcomes to effort-related explanations. Therefore, this dissertation seeks to better understand whether embodiment can strengthen the effects of struggle stories on preschoolers’ perseverance.

**General Reading Strategies.** Finally, to effectively implement an intervention using storybooks as pedagogy (with or without vicarious praise or roleplaying), it is important to employ standard reading practices for this age group, such as reading the stories more than once (Trivette, Simkus, Dunst, & Hambry, 2012) and asking open-ended questions (Silva, Strasser, & Cain, 2014). Classroom teachers and parents frequently use these techniques while reading to increase attention and engagement, as well as to support general comprehension. In an effort to create high-quality reading experiences, this dissertation utilized both repeat exposure and effective questioning strategies throughout all reading tasks.

**Repeat Exposure.** Several researchers have shown that repeated readings of storybooks can increase comprehension, learning, and enjoyment of a story (Hoggan & Strong, 1994; Owens & Robinson, 1997). For example, research by Sénéchal (1997) explored how repeated storybook
reading can increase vocabulary learning. The study recruited sixty preschool children (three- to four-years old) and identified ten target words for the participants to learn. Compared to the single reading condition, the children in the repeated reading condition, who heard the story twice over two separate sessions, learned more receptive and expressive vocabulary from the story. Research by Penno, Wilkinson, and Moore (2002) supported findings from Sénéchal (1997), through their exploration of repeated readings with 47 five-year old children in Australia. A meta-analysis, by Trivette et al. (2012) examined how repeated readings impact early literacy and language development across sixteen empirical papers, both published and unpublished. Their results suggest that repeated story reading can increase vocabulary development and story comprehension. In terms of frequency, the average effect size for two to three repeated readings was large (d=.70). When the length of time between readings was greater than three days, the average effect was still moderate (d=.61). Given this literature, an effective storybook intervention should include at least two exposures to the narratives to help children comprehend critical plot points and improve their ability to learn key motivational behaviors (i.e., persistence).

**Effective Questioning Strategies.** In addition to the work on repeat exposure, other researchers have explored several techniques to improve reading comprehension for young children, including connecting concepts to prior knowledge, asking children to predict the plot of a story, and prompting children to retell or recall events in the story (DeBruin-Parecki, 2009; DeBruin-Parecki & Squibb, 2011; McKeown & Beck, 2006; Morrow, Freitag, & Gambrell, 2009; Palincsar & Brown, 1984; Paris & Paris, 2003; Van Kleek, 2008). Asking children to respond to open-ended questions before, during, or after reading a story has been shown to support
comprehension (Strasser, Larrain, & Lissi, 2013). For example, Silva, Strasser, and Cain (2014) found that asking open-ended questions (e.g., “What do you think will happen next?”) can help five- and six-year old pre-readers produce coherent narratives, indicating a deeper understanding of the story. Further, research by Walker, Bonawitz, and Lombrozo (2017) asked five- and six-year old children to explain or recall different elements of a storybook (e.g., “Can you remind me, [can you tell me, why] was Mr. Muffet happy at the end of the story?”). Children who explained elements of the story were more likely to extract the moral of the narrative.

Researchers have also explored using explanation in domains outside reading comprehension, such as math and science. These studies found similar relationships between explanations and the ability to extract concepts and generalizations (Lombrozo, 2006, 2012; Lombrozo & Carey, 2006; Williams & Lombrozo, 2010). Additional research has shown increased transfer effects when children are asked about goal-related elements of the story (Brown & Kane, 1988). Brown, Kane, and Echols (1986) read several stories to preschoolers that depicted different characters encountering similar problems with similar solutions (e.g., the ability to use a hollow tube to transfer objects). After reading the stories, children in the first condition were asked to recall elements of the goal structure (e.g., main character, problem, solution). Preschoolers in the second condition were simply asked to recall the story, and participants in the third condition were given no prompt. All children were then asked to complete an analogous transfer task. Results indicated that children who were prompted to recall elements of the goal structure, as well as the children who spontaneously recalled these elements in the recall-only condition, outperformed children in the control group. Generally, it seems that using open-ended questions, such as predictive, explanatory, or recall-related questions, can promote deeper narrative
comprehension and enhance preschoolers’ ability to extract the overarching lesson of a storybook.

1.6 Conclusion

Current research supports using struggle narratives to increase persistence in adolescents (Lin-Siegler, Ahn, Chen, Fang, & Luna-Lucero, 2016); however, many questions remain unanswered about if and how these stories can be used for young children. Storybooks where characters model hard work, utilize different strategies, and experience failure before accomplishing a challenging goal may help unconsciously elicit an incremental mindset by promoting success attributions to hard work and failure attributions to a lack of effort, rather than inability or other external factors. Evidence suggests the use of some storybook role models may be an effective intervention strategy for young children on novel tasks (Master, 2011), although it is still unclear if and how struggle stories can be effectively used to promote persistence after initial failure. Previous research with young children has also lacked basic integration of narrative comprehension strategies, such as asking questions while reading, reading the same story more than once, and providing concrete contrasting examples to promote transfer. Will children who listen to struggle-stories show increased persistence on difficult tasks after experiencing salient failure on similar tasks? Does hearing praise directed at characters’ hard work and use of multiple strategies (i.e., vicarious praise) in struggle-stories increase a child's persistence on challenging tasks? Do children demonstrate increased persistence on challenging tasks when they roleplay struggle-stories?
Chapter 2: Methods

2.1 Research Questions

The primary goal of the present research is to determine whether children who listen to struggle-stories, compared to a control group, demonstrate a higher level of persistence on difficult tasks (RQ1). By presenting children with storybook characters who take on a challenging task, work hard, cope with failure, and use multiple strategies to solve their problem, the present research hopes to create models of persistence for children to learn positive behaviors in response to failure. However, using storybooks alone requires children to not only abstract the underlying moral of the story, but transfer the concept to the challenging tasks in the study.

To increase the effect of struggle-stories, the present study experimented with two additional techniques to reinforce the narrative: vicarious praise and roleplaying. Can reading struggle-stories in combination with praising storybook characters for their effort and use of multiple strategies help promote persistence on a challenging task (RQ2)? By directing attention towards the persistent behaviors of the storybook characters, children may become more likely to persist when they too encounter a difficult problem. Finally, this dissertation will also explore the impact of listening to struggle-stories and roleplaying their narratives on persistence on challenging tasks (RQ3). By asking children to embody the storybook characters, children will have the opportunity to practice persistence that may aide later problem-solving.

2.2 Participants

Seven preschools and daycares and ninety-two children from the greater Boston area participated in the present study. All of the schools were located in suburban towns, including Framingham, Lincoln, Acton, Wilmington, Newton, and Andover. Within each school, participants were
recruited by classroom, rather than by age alone, to avoid social isolation or exclusion. Parent consent forms were sent home with children who were in classrooms comprised of a majority of four- and five-year old children. Given the transitional time of late-summer and fall when data collection occurred, some children were not quite age four when the study began. Although the present research aimed to recruit only four- and five-year old children, younger children were also permitted to participate in the study in an effort to reduce any negative social effects. Children below the age of three-and-a-half were not invited to participate, but still received a small token of thanks along with the other children to prevent inequalities.

Participants ranged in age from 44.8 to 70.0 months old (3.7-5.8 years), with an average age of 56.6 months (4.7 years). The majority of children (80%) were between 49.0 and 65.7 months old (4.1-5.5 years). Approximately half of the participants were female (53.8%). Out of a total of 92 participants, 64.8% identified as White, 15.4% as Hispanic, 11.0% as Asian, 4.4% as Black, and 4.4% as multiracial (Asian and White).

2.3 Materials

The present research developed storybooks and adapted measures of persistence to create age-appropriate materials for this intervention-study.

*Storybook Creation and Adaptation.* While there are inherent differences in struggle-stories and non-struggle narratives, it was critical to develop stories that controlled for extraneous factors that could influence a child’s proclivity towards each book, including characters and general plot features. To control for these confounding factors, storybooks pairs were created to isolate motivationally-charged behavior (failure, persistence, effort). While each narrative in pair used
the same characters and general plot (including similar text phrases and illustrations), only the struggle-stories included persistence in the face of failure.

The first set of storybooks (“John and June Climb a Tree”) was about two siblings, John and June, who wanted to climb a tree in their backyard. In both the struggle-stories and non-struggle books, the story began with a short description of each main character and introduced their goal of climbing a tall tree. This consistency allowed the first six pages to share the exact same text and illustrations. As the story progressed, the two versions differed in two distinct ways. First, in the struggle narrative, the characters demonstrated hard work and the use of multiple strategies before finally figuring out a way to successfully climb the tree. In contrast, the non-struggle narrative depicted John and June discovering a successful strategy to climb the tree quite easily. Second, the struggle-story explicitly conveyed the frustration John and June felt as they failed to achieve their goal, while the non-struggle storybook did not include any moments of failure. Both storybooks were twenty pages long (ten spreads) with approximately 900 words.

The second set of storybooks (“Rocks That Roll,” adapted from “Ricky The Rock That Couldn’t Roll by Jay Miletsky) was about two anthropomorphic rocks, Ellie and Harry, who were having fun playing together outside. In both the struggle-story and non-struggle narrative, the book began with a short description of each main character, including how Harry was a large, round rock and Ellie was a large, round rock with one flat side. This consistency allowed the first four pages to share the exact same text and illustrations. In the struggle-story, Ellie and Harry have a clear goal of helping Ellie roll down the hill like Harry. Throughout the story, they try two different unsuccessful strategies (pushing, gluing blueberries) before finally discovering that piling mud on Ellie’s flat side could be used to help her roll. In the non-struggle version, the
rocks enjoyed a fun day outside where they engaged in the same behavior (pushing, gluing blueberries, piling mud) as the rocks in the struggle-story, but instead always reacted positively to the outcome of each activity. While the rocks in the non-struggle story had no goal of helping Ellie roll, both narratives end with a demonstration of how mud can be used to help Ellie roll. This allowed several text phrases and images throughout both stories to look similar. Both storybooks were eighteen pages long (nine spreads) with approximately 600 words.

**Measures of Behavioral Persistence.** Researchers have used several different approaches to measure persistence, including self-reports, teacher-reports, and behavioral observations. When trying to understand a child’s goal-setting strategies, willingness to seek challenges, or feelings towards an activity, researchers tend to utilize self-reports or teacher-reports (Ayres, Cooley & Duncan, 1990). While teacher-reports can provide some insight into a child’s persistence, these reports can be biased by the teacher’s general perception of the child (e.g., “James always pays attention when I give instructions to the class, he’s a great student!”). Similarly, self-reports may not accurately measure persistence, particularly for children who have poor metacognitive skills or struggle with verbal explanations of internal states, which limits the validity of self-reports (Quattrone, 1985).

In addition to verbal or written reports, persistence can also be measured through behavior (i.e., by directly assessing time spent on a challenging task). This type of measurement is particularly effective if the ultimate goal of the intervention is to influence the behavior of a child, as it directly assesses the outcome in question. Previous literature suggests persistence behavior can be accurately measured in three ways. One strategy is to measure how many attempts a child makes to complete a goal or task (Leonard, Lee, & Schulz, 2017). This measure
is not based on the amount of time a child spends trying to complete a task, but rather just the
number of times a child attempts to reach a goal. This methodology can be valid for tasks where
individual attempts are easily observed and last for approximately the same amount of time. A
second way to measure persistence is to determine whether a child will continue to work on a
challenging task until completion, or switch to an easy task (Thomas & Pashley, 1982). For this
type of measurement, children who persist on a task until completion demonstrate a higher level
of persistence than those who switch to an easier task. However, given the developmental
differences of young children, it is difficult to find a task that is both challenging, yet achievable
if the child simply persists. For instance, these types of tasks may inadvertently rely too heavily
on other cognitive abilities, such as working memory or spatial reasoning, that enable some
children to complete the task much easier than others. Finally, researchers have also measured
persistence by timing how long a child will work on a difficult or impossible task before giving
up (Feather, 1972; Medway & Venino, 1982). This type of measurement works well for a wider
variety of developmental and ability levels, as the difficulty level can be raised until the majority
of children cannot complete the task. Therefore, this dissertation measured persistence by time
spent working on a difficult task.

**Wooden Tetris Puzzle (Puzzle).** The first measure of persistence was called the Wooden Tetris
Puzzle (puzzle). Children were presented with either thirteen (pre-intervention) or nine (post-
intervention) wooden shapes that fit into a triangle (pre-intervention) or cross (post-intervention)
shaped board. Participants were instructed to fit all of the pieces into the board so that there were
no holes or overlaps. The researchers demonstrated how the shapes could be placed into the
board, rotated, and inverted. After all instructions were given, the researcher asked if the child
understood the task and answered any questions. Before beginning the puzzle, the researcher
gave a final reminder to the child he or she could stop playing with the puzzle at any time and play another game. If the child was still working on the puzzle after three minutes, the researcher again reminded the child, “you can stop anytime, and we can play a different game.” This reminder was repeated after six, nine, twelve, and fifteen minutes. After eighteen minutes, the researcher asked the participant if he or she “would like to keep working, or play a different game.” This question was repeated after 21, 24, 27, and 30 minutes. The task was terminated if any of the following conditions were met: 1) 30 minutes had elapsed; 2) the child completed the puzzle; or 3) the child (or researcher) ended the task due to boredom, frustration, etc.

**Search and Find Task (Search Task).** Children were presented a series of three search and find tasks (search task) at both pre- and post-intervention. Search tasks require an individual to look at a picture and locate specific sub-images, similar to “Where’s Waldo.” The first two search tasks were scaffolding measures designed to familiarize each participant with the task, while the final search task was used to measure persistence.

The first search task required children to spot six different animals (pre-intervention) or toys (post-intervention) from a cartoon scene. The second search task required children to spot six different characters (pre-intervention) or clothing items (post-intervention) from a cartoon scene. The final search task required children to locate ten penguins from an image of a museum filled with people and artifacts (pre-intervention) and a Mardi Gras scene (post-intervention). Every three minutes, the researcher reminded the child, “remember, you can stop at any time, and we can play a different game.” After 18 minutes, the researcher asked the participant if he or she “Would like to keep looking, or play a different game?” This question was repeated after 21, 24, 27, and 30 minutes. The task was terminated if any of the following conditions were met: 1)
30 minutes had elapsed; 2) the child found all ten penguins; or 3) the child (or researcher) ended the task due to boredom, frustration, etc.

**Impossible Shape Sorter (Sort Task).** Children were presented with a box containing four holes — one square, one triangular, one circular, and one pentangular. The researcher demonstrated how certain blocks can fit through these holes. The researcher then showed the child a new shape and asked, “Do you think you can fit this shape inside the box through one of these holes?” After the child responded, the researcher instructed the child to try to fit the shape into one of the holes and stop when he or she requested to move on to the next activity. The new shape given to the child was always too large to fit into any of the holes on the box. Unlike the puzzle and search task, the sort task was designed to determine if the intervention increased persistence on a clearly impossible task. Although increasing perseverance is typically positive, some forms of persistence can be wasteful, particularly when effort is not correlated with better outcomes.

**Post-Intervention Self-Reports.** In an effort to control confounding factors, additional post-intervention-only self-reports were administered to measure what children learned from the storybooks, their willingness to seek challenges, storybook character and narrative likability, perceived character intelligence, and perceived effort during each behavioral persistence measurement.

**Learning Statements.** This measure was designed to glean information about what each child learned from each storybook. After reading each storybook for the second time, children were asked, “what did you learn from this storybook?” Additional prompts were utilized for children
who were confused by the original question, such as, “Did you learn something in the rock book? What did you learn?” All answers were acceptable, including “I don’t know” or “I learned nothing.” Although prompts did not directly ask children about attributions or theories of intelligence, this measure implicitly captured conscious (or even unconscious) beliefs about effort, failure, and ability. The coding schematic was developed post-data collection and will be discussed in the next chapter.

**Challenge Seeking Self-Report.** This measure was designed to assess the participants’ willingness to try to complete a challenging task, rather than an easier task. The twelve questions were adapted from Master (2011) and divided into three categories: puzzle-related challenges, search-and-find related challenges, and general activities. For example, one question asked, “I have one puzzle that will take a long time to finish, and another one you can do quickly. I might give you the puzzle that takes a lot of time or one you can do quickly. Which one do you want to do?” Each question had two response options that indicated whether the child wanted to complete the easier or harder task. After selecting a response, the child was then asked, “Great Choice! Why did you choose [insert response]?” Responses were coded for quantitative analyses. Challenge-seeking responses were coded as “1” and challenge-avoiding responses were coded as “0”. The sum of all twelve questions comprised the child’s Challenge Seeking Score (possible range from zero to twelve). Lower scores indicated a higher desire for challenges.

**Character and Storybook Self-Report.** Children were asked questions about the main characters from each of the two stories, as well as the narrative as a whole. For each character, there were two questions aimed to assess: 1) how much the child liked the character; and 2) the child’s
perceived intelligence of the character. Children were also asked how much they liked each storybook as a whole. All questions were asked using a Likert scale using both verbal responses and accompanying visuals. The child was also presented an image of the character or book being assessed. For likability, children were asked “How much do you like [insert character name]?” or “How much did you like this book?” while images of five hearts increasing in size were presented to the child. For perceived intelligence, images of five brains increasing in size were presented to the child. These visuals were used to represent the magnitude of the five response options. The researcher asked the question and provided five response options while pointing to the corresponding visual. Children would either respond by repeating the response option or pointing to the visual. Each response was confirmed by the researcher, “You think John is really smart?” to which the child would reply either “yes” or “no” to ensure the correct response was recorded. Responses were coded from one to five, with five being either “I really, really like him/her” or “really, really smart.” Averages for likeability and perceived intelligence were used to determine general likability and perceived intelligence across both stories.

**Perceived Effort Self-Report.** Although behavioral persistence is arguably more accurate measure than self-reported persistence, participants were also asked to reflect on how hard they tried on each challenging task. For this task, the physical measurement tool (e.g., puzzle) was placed in front of the child one at a time. The researcher then asked, “how hard did you try on [insert task]?” This five-point Likert-style question was accompanied with a visual scale depicting a cartoon character pulling a rope, increasing in size. Each response was confirmed by the researcher, “You tried really, really hard on the puzzle?” to which the child would reply
either “yes” or “no” to ensure the correct response was recorded. Responses were coding from one to five, with five being “I tried really, really hard.”

2.4 Conditions

Participants were assigned to four conditions using simple randomization with stratification by gender: control, motivational, praise, and roleplaying. In the control condition, children listened to the control versions of “Rocks That Roll” and “John and June Climb a Tree” (see Figure 3 below). Throughout the reading, the researcher engaged the child by asking questions and commenting on the content of the story. In the motivational condition, children listened to the struggle versions of “Rocks That Roll” and “John and June Climb a Tree.” Again, the researcher in this condition helped maintain child engagement by asking questions and commenting on the content of the story. In the praise condition, children listened to the struggle versions of “Rocks That Roll” and “John and June Climb a Tree,” while the researchers praised the storybook characters for working hard and using multiple strategies to solve the problem. Finally, children in the roleplaying condition listened to the struggle versions of “Rocks That Roll” and “John and June Climb a Tree,” while the researcher commented on the content of the story and asked questions (same as the motivational condition). After reading each story, the researcher prompted each child to play like one of the storybook characters for two minutes per story. Please refer to Appendix A for all reading scripts and roleplaying guides.
The present study required each child to participate twice over the course of two weeks. In the first week, each child completed the first study session. The second study session occurred approximately one week later. The structure of the two sessions is described below (see Figure 4 below).

**Session One.** During the first session, each participant was escorted from his or her classroom to a safe and quiet study location (extra classroom, reading nook, hallway, etc.). The participant
then completed all three measures of behavioral persistence, starting with the puzzle (see Figure 5 below). The child then completed the search task and the sort task. After all behavioral measurements were completed, the child received one of the four interventions (control, motivational, praise, or roleplaying). This meant the researcher read either the control or struggle-storybooks, depending on his or her condition. Children in the praise condition heard the researcher praise storybook characters, while participants in the roleplaying group were given the chance to reenact the struggle-story (1-2 minutes for each story). After checking for narrative comprehension, the child was then returned to his or her classroom. It took about 30 minutes to complete session one.

**Session Two.** During the second session, each participant was again escorted from his or her classroom to a safe and quiet study location. The researcher then implemented the intervention for the second time, reading either the control or struggle storybooks. Again, children in the praise condition heard the researcher praise storybook characters, while participants in the roleplaying group were given the chance to reenact the struggle-story (1-2 minutes for each story). Children were then asked to identify two pieces of information they learned from each story (learning statements). Finally, children completed all three measures of behavioral persistence and completed the self-report measures (challenge-seeking survey, character and storybook survey, and perceived effort survey). Once all the measurements were completed, the child was returned to his or her classroom. It took about 40 minutes to complete session two.
Figure 5: Procedures by Session.
Chapter 3: Results

3.1 Demographic Measures

Preliminary analyses were conducted to detect differences between groups by age, sex, and ethnicity. The average age across conditions was nearly identical, with the largest difference between the control and roleplaying groups (56.5 months) and the praise group (57.1 months). This is about a two-week age difference. Congruently, a one-way ANOVA found no statistical differences between groups by age (F(3,88)= .072, p= .96, d= .09). As for the other demographic features, two chi-squares revealed no significant differences between sex by condition ($X^2$ (3, N = 92) = 3.16, $p = .37$, Cramer’s $V = .19$) or by ethnicity ($X^2$ (3, N = 92) = 6.64, $p = .88$, Cramer’s $V= .16$). Thus, the profile of children across each of the conditions were approximately congruent with respect to key demographic features.

To ensure children in the study understood the general plot of each storybook to mitigate confounding factors, the researcher repeatedly assessed participants’ comprehension of each story. Children who were not paying attention and listening to the stories would have trouble recalling the narratives and therefore were eliminated from the study. However, all children in the present research could accurately communicate the general storyline for each book; thus, no children were removed due to inattention.
3.2 Pre-Intervention Quantitative Measures

Table 2: Pre-Intervention Means and Standard Deviations for Measurements of Behavioral Persistence (seconds).

<table>
<thead>
<tr>
<th>Pre-Intervention</th>
<th>Puzzle Mean</th>
<th>Puzzle Std. Deviation</th>
<th>Search Task Mean</th>
<th>Search Task Std. Deviation</th>
<th>Sort Task Mean</th>
<th>Sort Task Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>208.87</td>
<td>67.63</td>
<td>148.48</td>
<td>78.90</td>
<td>5.61</td>
<td>3.50</td>
<td>23</td>
</tr>
<tr>
<td>Motivational</td>
<td>199.68</td>
<td>108.13</td>
<td>171.95</td>
<td>90.46</td>
<td>4.23</td>
<td>1.97</td>
<td>22</td>
</tr>
<tr>
<td>Praise</td>
<td>205.13</td>
<td>135.43</td>
<td>130.96</td>
<td>91.03</td>
<td>4.17</td>
<td>1.63</td>
<td>24</td>
</tr>
<tr>
<td>Roleplaying</td>
<td>236.52</td>
<td>151.23</td>
<td>165.48</td>
<td>143.52</td>
<td>5.09</td>
<td>5.32</td>
<td>23</td>
</tr>
</tbody>
</table>

**Wooden Tetris Puzzle (Puzzle).** No participants were able to solve the puzzle, meaning at some point all participants requested to stop working on the task. The amount of time children persisted on the puzzle ranged from 32 seconds to 620 seconds, with an average of 212.6 seconds. By condition, children persisted for an average of 208.9 seconds (control), 199.7 seconds (motivational), 205.1 seconds (praise), and 236.5 seconds (roleplaying) (see Table 2 above and Figure 6 below). A one-way ANOVA found no statistical differences between conditions by time with a small effect size (F(3,88)= .427, p= .73, d= .24). Given the effect size, post-intervention analyses should include times on the puzzle at pre-intervention as a covariate.

![Figure 6: Pre-Intervention Boxplot of Time Spent (seconds) Persisting on the Puzzle. Note: asterisks indicate outliers determined by Q1 – (1.5 x IQR) and Q3 + (1.5 x IQR).]
**Search and Find Task (Search Task).** No participants were able to find all ten penguins in the search task, meaning at some point all participants requested to stop working on the task. The amount of time children persisted on the search task during the pre-intervention ranged from 22 to 665 seconds, with an average time of 153.7 seconds. By condition, children persisted for an average of 148.5 seconds (control), 172.0 seconds (motivational), 131.0 seconds (praise), and 165.5 seconds (roleplaying) (see Table 2 above and Figure 7 below). A one-way ANOVA found no statistical differences between groups by time with a small effect size (F(3,88)= .726, p= .54, d= .31). Given the effect size, post-intervention analyses should include search task times at pre-intervention as a covariate.

The average number of penguins found across all four conditions was 2.58 penguins. By condition, children found an average of 2.70 penguins (control), 2.73 penguins (motivational), 2.13 penguins (praise), and 2.78 penguins (roleplaying). A one-way ANOVA found no statistical differences between conditions by penguins found (F(3,88)= .330, p=.80, d=.21). To determine

![Figure 7: Pre-Intervention Boxplot of Time Spent (seconds) Persisting on the Search Task. Note: asterisks indicate outliers determined by Q1 – (1.5 x IQR) and Q3 + (1.5 x IQR).](image-url)
whether more time on the search task was associated with a higher number of penguins found, a Pearson correlation was calculated. Results found a significant positive correlation between the persistence on the search task and the number of penguins found (N= 92, r = .67, p < .001). These data suggest a higher level of persistence on the search task led to more positive outcomes (more penguins found).

**Impossible Shape Sorter (Sort Task).** The amount of time children persisted on the sort task ranged from 1 second to 28 seconds, with an average of 4.77 seconds. By condition, children persisted for an average of 5.61 seconds (control), 4.23 seconds (motivational), 4.17 seconds (praise), and 5.09 seconds (roleplaying) (see Table 2 above and Figure 8 below). A one-way ANOVA found no statistical differences between groups by pre-intervention time with a small effect size (F(3,88)= .956, p= .42, d= .36). Given the effect size, post-intervention analyses should include the sort tasks times at pre-intervention as a covariate.

![Figure 8: Pre-Intervention Boxplot of Time Spent (seconds) persisting on the Sort Task. Note: asterisks indicate outliers determined by Q1 – (1.5 x IQR) and Q3 + (1.5 x IQR).](image-url)
Across all conditions, approximately 85% of the sample believed the task was impossible. There were no differences between conditions by perceived impossibility of the task, as determined by a chi-square test of independence ($X^2 (3, N = 92) = 3.5, p = .32$, Cramer’s $V = .20$).

### 3.3 Post-Intervention Quantitative Measures

Before examining statistical differences between groups, preliminary analyses were conducted to examine dependent variables and their correlations, as well as covariates.

<table>
<thead>
<tr>
<th>Post-Intervention</th>
<th>Puzzle Mean</th>
<th>Puzzle Std. Deviation</th>
<th>Search Task Mean</th>
<th>Search Task Std. Deviation</th>
<th>Sort Task Mean</th>
<th>Sort Task Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>148.86</td>
<td>176.64</td>
<td>94.45</td>
<td>75.95</td>
<td>4.91</td>
<td>4.44</td>
<td>22</td>
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<tr>
<td>Motivational</td>
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<td>114.06</td>
<td>149.24</td>
<td>103.10</td>
<td>3.45</td>
<td>1.82</td>
<td>21</td>
</tr>
<tr>
<td>Praise</td>
<td>267.75</td>
<td>143.07</td>
<td>227.62</td>
<td>157.86</td>
<td>3.29</td>
<td>1.46</td>
<td>24</td>
</tr>
<tr>
<td>Roleplaying</td>
<td>121.39</td>
<td>83.85</td>
<td>164.22</td>
<td>188.05</td>
<td>4.26</td>
<td>2.91</td>
<td>23</td>
</tr>
</tbody>
</table>

**Wooden Tetris Puzzle (Puzzle).** No participants were able to solve the puzzle after the intervention, meaning at some point all participants requested to stop working on the task and do something else. Participants in the control group persisted for 146.0 seconds on the puzzle, an average reduction of 62.9 seconds from pre-intervention times. Times ranged from 31 to 753 seconds with a median of 90 seconds. Similarly, participants in the roleplaying condition persisted for an average of 121.4 seconds, a reduction of 115.1 seconds from pre-intervention times. Times ranged from 13 to 295 seconds with a median of 103 seconds. Participants in the motivational group showed a smaller difference between pre- and post-intervention persistence, averaging 182.5 seconds (a 17.2 second reduction). Times ranged from 19 to 455 seconds with a
median of 148 seconds. Finally, participants in the praise condition averaged 267.8 seconds on the post-intervention, an increase of 62.7 seconds from pre-intervention. Times ranged from 86 to 714 seconds with a median of 228 seconds (see Table 3 above).

**Search and Find Task (Search Task).** Two participants were able to find all ten penguins during the post-intervention, meaning at some point all, but two, participants requested to stop working on the task and do something else. These two participants were from different conditions (control, motivational) and were excluded from further group analyses, as the task was ended due to success rather than failure.

Participants in the control group spent an average of 94.5 seconds persisting on the search task, a reduction of 54 seconds from pre-intervention. Times ranged from 16 to 255 seconds with a median of 59.5 seconds. Participants in roleplaying condition persisted for an average of 164.2 seconds, a reduction of 1.3 seconds from pre-intervention. Times ranged from 8 to 878 seconds with a median of 111 seconds. Participants in the motivational group showed a smaller difference between pre- and post-intervention persistence, averaging 149.2 seconds (a 23 second reduction). Times ranged from 31 to 420 seconds with a median of 122 seconds. Finally, participants in the praise condition averaged 227.6 seconds on the post-intervention, an increase of 97 seconds from pre-intervention. Times ranged from 30 to 744 seconds with a median of 206 seconds (see Table 3 above).

To determine whether more time on the search task was associated with a higher number of penguins found, a Pearson correlation was calculated. Results found a significant positive correlation between the persistence on the search task and the number of penguins found (N= 90, r = .74, p < .001). The average number of penguins found across all four conditions was 3.15
penguins at post-intervention. By condition, children found an average of 2.23 penguins (control), 3.19 penguins (motivational), 3.25 penguins (praise), and 3.30 penguins (roleplaying). A one-way ANCOVA, with pre-intervention scores as the covariate, found no statistical differences between conditions by penguins found, with a medium effect size (F(3,85)= 1.91, p= .135, d= .52). Despite the non-significant omnibus ANCOVA, an analysis comparing estimated marginal means identified a statistically significant difference between the control and praise groups, with children in the praise condition finding more penguins (p= .025).

It was also important to consider the number of penguins found during the first minute, to determine if a higher number of penguins found at the beginning of the task influenced persistence. Across all conditions, 62% of the total number of penguins found were located within the first minute of the activity, for an average of 1.6 penguins. A one-way ANOVA found no statistical differences between conditions by penguins found during the first minute, with a very small effect size (F(3,86)= .707, p= .551, d= .31). Given the small effect, post-intervention analyses may analyze how the number of penguins found during the first minute at post-intervention affects the results.

**Impossible Shape Sorter (Sort Task).** The amount of time children persisted on the sort task ranged from 1 second to 22 seconds, with an average of 3.98 seconds. By condition, children persisted for an average of 4.91 seconds (control), 3.45 seconds (motivational), 3.29 seconds (praise), and 4.26 seconds (roleplaying) (see Table 3 above). These times were roughly equivalent to pre-intervention times.

Across all conditions, approximately 82% of the sample believed the task was impossible. There were no differences between perceived impossibility of the task by condition,
as determined by a chi-square test of independence ($X^2 (3, N = 92) = 3.5, p = .54$, Cramer’s $V = .15$).

**Challenge-Seeking Self-Report.** Children’s scores on the challenge-seeking questionnaire ranged from 0 points to 12 points, with an average of 3.55 points. On this scale, a score of 12 represented a strong willingness to seek challenges. By condition, children scored an average of 3.57 (control), 4.45 (motivational), 3.54 (praise), and 2.70 (roleplaying). A one-way ANOVA found no statistical differences between conditions by score with a very small effect size ($F(3,88) = .824, p = .48, d = .33$). Challenge-seeking scores were not correlated with the puzzle ($r = .141, p = .179$), the search task ($r = .199, p = .060$), or the sort task ($r = .000, p = .999$).

**Character Likeability.** The average likability score for each storybook character is reported in Appendix B. Pearson correlations revealed a strong significant correlation between male storybook characters ($r = .348, p = .001$) and female storybook characters ($r = .289, p = .005$). Two new variables were created to account for this correlation: an average likability score for female characters and an average likeability score for male characters. There was no significant correlation between these two new variables ($r = -.171, p = .102$). Results from two consecutive ANOVAs found no significant differences between conditions by average female character likability ($F(3,88) = 2.48, p = .067, d = .58$) or by average male character likability ($F(3,88) = .570, p = .64, d = .28$).

Additional analyses revealed that female participants liked female characters more than male participants ($F(1,90) = 32.0, p < .001, d = 1.2$) and male participants liked male characters more than female participants ($F(1,90) = 6.98, p = .010, d = .56$).
Perceived Character Intelligence. The average perceived intelligence scores for each storybook character is reported in Appendix B. Pearson correlations revealed a strong significant correlation between male storybook characters (r=.311, p=.003) and female storybook characters (.239, p=.022). Two new variables were created to account for this correlation: an average perceived intelligence score for female characters and an average perceived intelligence score for male characters. There was no significant correlation between these two new variables (r=.150, p=.154). Results from two consecutive ANOVAs found no significant differences between conditions by average perceived intelligence for female characters (F(3,88)=1.27, p=.289, d=.42) or by average perceived intelligence for male characters (F(3,88)=.614, p=.61, d=.29).

Additional analyses revealed no differences in perceived male character intelligence for male and female participants (F(1,90)=.767, p=.383, d=.18). Findings were the same for female characters, detecting no significant differences between male and female participants (F(1,90)=3.37, p=.070, d=.39). However, the data supports a general tendency for children to rate characters of their own sex as being more intelligent than those of another sex.

Storybook Likability. Participants reported an average likability score of 4.1 for “John and June Climb a Tree” and 4.3 for “Rocks That Roll.” There was no significant correlation between average likeability both storybooks (r=.181, p=.085). Results from an ANOVA found a significant difference between conditions by average likeability for “John and June Climb a Tree” (F(3,88)=2.78, p=.045, d=.62). Pairwise comparisons found significant differences between the control and motivation groups (p=.007) and the control and praise groups (p=.048). This indicates that participants in the motivational and praise conditions reported liking “John and June Climb a Tree” more than children in the control condition. However, results from a
second ANOVA found no significant difference between conditions by average likeability for “Rocks That Roll” (F(3,88)= .007, p=.999, d=.00).

**Perceived Effort Self-Report.** The average perceived effort scores for the puzzle was 4.26, indicating most children believed that they tried hard to complete the puzzle. Similarly, the averaged perceived effort score for the search task was 4.27, meaning children reported trying hard to find all ten penguins. There was no significant correlation between perceived effort for the puzzle or the search task (r=.187, p=.074). Results from two consecutive ANOVAs found no significant differences between conditions by perceived effort for the puzzle (F(3,88)= 2.43, p=.071, d=.58) or by average perceived effort for the search task (F(3,88)= .280, p=.84, d=.19).

**3.4 Post-Intervention Qualitative Measures**

**Learning Statements.** Learning statements were qualitatively coded to detect the presence of three major persistence-related themes: failure, effort, and, strategy-use. Statements relating to effort included phrases such as, "they kept trying and trying; they kept trying and trying and didn't give up; never give up.” Statements relating to strategy-use included phrases, such as “…tried with their feet and with their hands and with a trampoline and then they went into the garage…” Finally, examples of failure within learning statements include, “they used the trampoline to try to get up but they couldn't; them couldn't climb the tree and then they found a big ladder.” Participants each produced two learning statements, one for each story, that were coded using a simple schema (see Table 4 below).
### Table 4: Coding Schema.

<table>
<thead>
<tr>
<th>Code</th>
<th>Effort</th>
<th>Strategy</th>
<th>Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Neither learning statement</td>
<td>Neither learning statement</td>
<td>Neither learning statement</td>
</tr>
<tr>
<td></td>
<td>mentioned effort</td>
<td>mentioned strategy-use</td>
<td>mentioned failure</td>
</tr>
<tr>
<td>1</td>
<td>One learning statement</td>
<td>One learning statement</td>
<td>One learning statement</td>
</tr>
<tr>
<td></td>
<td>mentioned effort</td>
<td>mentioned strategy-use</td>
<td>mentioned failure</td>
</tr>
<tr>
<td>2</td>
<td>Both learning statements</td>
<td>Both learning statements</td>
<td>Both learning statements</td>
</tr>
<tr>
<td></td>
<td>mentioned effort</td>
<td>mentioned strategy-use</td>
<td>mentioned failure</td>
</tr>
</tbody>
</table>

**Failure.** One major difference between the struggle-stories and non-struggle books centered on the inclusion of failure. The struggle storybooks included moments of failure, before eventually solving a problem, while the non-struggle storybooks did not depict failure at all. That said, only two children, 8.7%, in the control condition produced at least one learning statement that mentioned failure within the storybooks. Alternatively, the children in the other three condition produced a higher percentage of learning statements that highlighted failure. For example, 41% of the children in the motivational condition, 33% of children in the praise condition, and 35% of children in the roleplaying condition produced at least one learning statement mentioning failure (see Table 5 below). A chi-square test of independence was performed to examine the relation between condition and producing at least one learning statement mentioning failure in the storybooks. This relation was not significant, indicating there is no relationship between condition and failure statements produced ($\chi^2(3, N=92)= 6.66, p= .086, \text{Cramer's } V = .269$).

### Table 5: Learning Statements That Contain Failure (at least one statement).

<table>
<thead>
<tr>
<th>Counts</th>
<th>Statements coded as 0</th>
<th>Statements coded as 1 or 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>21</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>Motivational</td>
<td>13</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>Praise</td>
<td>16</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Roleplaying</td>
<td>15</td>
<td>8</td>
<td>23</td>
</tr>
</tbody>
</table>
However, this analysis does not examine the difference between producing one or two 
learning statements that include failure—27% of children in the motivational condition produced 
two learning statements that included failure, compared to just 8.3% of children in the praise 
condition, 4.3% of children in the roleplaying condition, and 0% of children in the control 
condition (see Table 6 below). Therefore, a second chi-square test of independence was 
performed to examine the relation between condition and the number of learning statements that 
mention failure in the storybooks. This relation was significant, indicating there is a relationship 
between condition and number of failure statements produced ($X^2$(6, N=92) = 15.366, p = .018, 
Cramer’s V = .289). Further examination of adjusted residuals indicated that children in the 
control condition produced significantly less statements with failure than children in the other 
conditions ($z = 2.5$). In contrast, children in the motivational condition were more likely to 
produce two statements containing the importance of effort than children in the other conditions 
($z = 3.2$). Although this data did not meet the assumed expected values of a chi-squared test for 
independence, a Fisher’s Exact Test revealed a similar p-value (p = .028, Fisher’s Exact Test).

### Table 6: Learning Statements That Contain Failure.

<table>
<thead>
<tr>
<th>Counts</th>
<th>Statements coded as 0</th>
<th>Statements coded as 1</th>
<th>Statements coded as 2</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Control</td>
<td>21</td>
<td>2</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Motivational</td>
<td>13</td>
<td>3</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Praise</td>
<td>16</td>
<td>6</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>Roleplaying</td>
<td>15</td>
<td>7</td>
<td>1</td>
<td>23</td>
</tr>
</tbody>
</table>

**Importance of Effort.** Another major difference between the struggle and non-struggle 
storybooks centered on the inclusion of effort. The struggle storybooks included depictions of 
characters exerting effort to solve problems, while the non-struggle storybooks illustrated
problem-solving sans much effort. Thus, only one child, 4.3%, in the control condition produced at least one learning statement that highlighted the use of effort within the storybooks.

Alternatively, 22% of children in the roleplaying condition produced at least one statement containing effort. Similarly, 36% of children in the motivational condition and 46% of children in the praise condition produced at least one learning statement emphasizing effort (see Table 7 below). A chi-square test of independence was performed to examine the relation between condition and learning statement highlighting the importance of effort. This relation was significant, indicating there is a relationship between condition and effort statements produced ($X^2(3, N=92)= 11.6, p=.009, \text{ Cramer’s } V = .354$). Further examination of adjusted residuals indicated that children in the control condition produced significantly fewer statements with effort than children in the other conditions ($z = 2.8$). In contrast, children in the praise condition were more likely to produce at least one statement containing the importance of effort than children in the other conditions ($z = 2.4$).

Table 7: Learning Statements That Contain the Importance of Effort (at least one statement).

<table>
<thead>
<tr>
<th>Counts</th>
<th>Statements coded as 0</th>
<th>Statements coded as 1 or 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>22</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>Motivational</td>
<td>14</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>Praise</td>
<td>13</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Roleplaying</td>
<td>18</td>
<td>5</td>
<td>23</td>
</tr>
</tbody>
</table>

While children in both the motivational and praise conditions produced a high percentage of learning statements (36% and 46% respectively), a deeper analysis of the learning statements suggested a difference between children who produced just one statement including effort and two statements (see Table 8 below). Only 14% of children in the motivational condition produced two learning statements including effort, compared to 29% of children in the praise
condition. A chi-squared test for independence again found a significant relationship between condition and effort statements produced (either one or two statements) \( \chi^2(6, N=92)= 14.625, \ p=.023, \text{ Cramer’s V } = .282 \). Further examination of adjusted residuals indicated that children in the praise condition were more likely to produce two learning statements containing the importance of effort than children in the other conditions \( z = 2.2 \). Although this data did not meet the assumed expected values of a chi-squared test for independence, a Fisher’s Exact Test revealed a similar p-value \( p=.023 \), Fisher’s Exact Test.

**Table 8: Learning Statements That Contain the Importance of Effort.**

<table>
<thead>
<tr>
<th>Counts</th>
<th>Statements coded as 0</th>
<th>Statements coded as 1</th>
<th>Statements coded as 2</th>
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<tr>
<td>Control</td>
<td>22</td>
<td>1</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Motivational</td>
<td>14</td>
<td>5</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>Praise</td>
<td>13</td>
<td>4</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>Roleplaying</td>
<td>18</td>
<td>1</td>
<td>4</td>
<td>23</td>
</tr>
</tbody>
</table>

**Importance of Using Multiple Strategies.** Finally, another difference between the struggle and non-struggle storybooks centered on the number of strategies characters used to solve problems. The struggle storybooks showed characters using multiple strategies to solve problems, while the non-struggle storybooks illustrated just one successful strategy. A chi-square test of independence was performed to examine the relation between condition and producing at least one learning statement highlighting the importance of using multiple strategies (see Table 9 below). This relation was not significant, indicating there is no relationship between condition and strategy statements produced \( \chi^2(3, N=92)= 1.24, \ p=.74, \text{ Cramer’s V } = .12 \). Although this data did not meet the assumed expected values of a chi-squared test for independence, a Fisher’s Exact Test revealed a similar p-value \( p=.77 \), Fisher’s Exact Test.  

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Table 9: Learning Statements That Contain the Importance of Using Multiple Strategies.

<table>
<thead>
<tr>
<th>Counts</th>
<th>Statements coded as 0</th>
<th>Statements coded as 1 or 2</th>
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<tr>
<td>Motivational</td>
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<tr>
<td>Praise</td>
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<td>24</td>
</tr>
<tr>
<td>Roleplaying</td>
<td>20</td>
<td>3</td>
<td>23</td>
</tr>
</tbody>
</table>

3.5 Research Questions Examined

To determine whether to conduct a multivariate or univariate analysis to answer the first research question, correlations were calculated between all behavioral measures of persistence. Pearson correlations were calculated between all behavioral measures of persistence. Results found a significant positive correlation between the puzzle and the search task (N= 92, r = .298, p= .004, see Figure 9 below), but no significant correlations between the sort task and puzzle (N= 92, r = -.121, p= .25) or the sort task and search task (N= 92, r = -.08, p= .48). This may partially be due to the small variation in the sort task times or that persistence on the puzzle or search task was unrelated to persistence on the sort task.

Figure 9: Post-Intervention Scatterplot of Time Spent (seconds) Persisting on the Puzzle and Search Task.
Before conducting the MANCOVA to determine any differences between conditions by persistence, statistical assumptions were examined. All assumptions were met, except multivariate normality and homogeneity of variance. Although Box’s test was significant \( (F(9, 81320) = 37.6, p < .001) \) and suggests non-homogeneity, F-tests are robust against this violation when conditions have similar sample sizes, which is true for the present study \((n= 22; n= 21; n= 24; n= 23)\). As for multivariate normality, initial calculations detected non-normality and identified two outliers. However, removing these outliers did not significantly affect multivariate normality, nor impact the results from the MANCOVA. Given the two outliers did not significantly impact the results and that F-tests are generally robust to violations of normality, a MANCOVA remains the most appropriate statistical test to analyze the present data.

A MANCOVA was conducted to determine if children who listened to struggle-stories increased their persistence on the puzzle and search task compared to their controlled counterparts. Using pre-intervention times for the puzzle and search task as covariates, results of the MANCOVA found a significant difference between conditions \( (F(6, 168) = 5.66, p < .001, \ d= .90) \). Both univariate tests were significant with large effect sizes \( (\text{puzzle } (F(3,84)= 6.15, p = .001, \ d= .934) \) and search task \( (F(3,84)= 8.20, p < .001, \ d= 1.08)) \). Pairwise comparisons were examined using Shaffer’s planned post-omnibus procedure (see Figure 10 below).
Figure 10: Post-Intervention Bar Chart of Time Spent (seconds) Persisting on the Puzzle, Search Task, and Sort Task.

To examine whether children who listened to struggle stories, compared to their controlled counterparts, demonstrated a higher level of persistence on difficult tasks, pairwise comparisons between the control and motivational conditions were examined. For the puzzle, children in the motivational condition persisted for an average of 17 seconds longer than those in the control condition, however this difference was not significant (p = .67, d = .12) (see Tables 10 and 11 below). Similarly, children in the motivational condition persisted longer on the search task by an average of 30 seconds, but again this difference was not statistically significant (p = .34, d = .28, see Figure 12). Therefore, there is no statistical evidence to suggest reading struggle storybooks, compared to non-struggle narratives, can positively affect a preschoolers’ persistence on challenging tasks (RQ1). Despite the lack of statistical significance, children who listened to the struggle-stories persisted longer on both tasks than those who heard the control books.
Table 10: Post-Intervention Pairwise Comparisons for Puzzle and Search Task (p-values).

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Motivational</th>
<th>Praise</th>
<th>Roleplaying</th>
</tr>
</thead>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
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<tr>
<td>Praise</td>
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<td>p=.011</td>
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<tr>
<td>Roleplaying</td>
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<td>n.s.</td>
<td>p&lt;.001</td>
<td>X</td>
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<td><strong>Search Task</strong></td>
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<td></td>
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<tr>
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<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivational</td>
<td>n.s.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Praise</td>
<td>p&lt;.001</td>
<td>p=.001</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Roleplaying</td>
<td>n.s.</td>
<td>n.s.</td>
<td>p=.001</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 11: Post-Intervention Pairwise Comparisons for Puzzle and Search Task (effect sizes).

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Motivational</th>
<th>Praise</th>
<th>Roleplaying</th>
</tr>
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<tr>
<td><strong>Puzzle</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Motivational</td>
<td>n.s.</td>
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While the struggle-stories alone may not be a strong enough intervention to impact persistence to a statistically significant extent, the combination of these narratives with vicarious praise or roleplaying may enhance the effect. To determine whether praising storybook characters for their effort and use of multiple strategies was an effective strategy to impact persistence, pairwise comparisons were examined between all conditions. For the puzzle, children in the praise condition persisted for an average of 120 seconds longer than participants in the control condition (p = .003, d= .64) (see Tables 10 and 11 above), 103 seconds longer than participants in the motivational condition (p = .011, d= .50), and 159 seconds longer than participants in the roleplaying condition (p < .001, d= .79) (see Figure 11 below). Similarly, in the search task, children in the praise condition persisted for an average of 137 seconds longer
than those in the control condition (p < .001, d= .68), 108 seconds longer than those in the motivational condition (p = .001, d= .40), and 99 seconds longer than those in the roleplaying condition (p = .001, d= .34) (see Figure 12 below). These results suggest that struggle-stories in combination with vicarious praise can more effectively promote persistence on challenging tasks compared to the other strategies (RQ2).

Figure 11: Pre- to Post-Intervention Time Spent (seconds) Persisting on the Puzzle.

Figure 12: Pre- to Post-Intervention Time Spent (seconds) Persisting on the Search Task.
To ensure this increase in persistence did not affect a preschooler’s effort on clearly impossible tasks, a one-way ANCOVA was conducted to determine differences in time spent on the sort task, using pre-intervention times as a covariate. Results indicated no significant differences between any of the conditions (F(3,87)= 1.35, p= .26, d= .43) (see Figure 13 below). This medium effect size is related to the control and roleplaying groups (4.9 and 4.3 seconds) spending more time persisting on the sort task than the motivational and praise conditions (3.5 and 3.3 seconds). Therefore, while vicarious praise helped promote persistence on challenging tasks, it did not encourage wasteful effort on an impossible one.

![Graph](image)

**Figure 13: Pre- to Post-Intervention Time Spent (seconds) Persisting on the Sort Task.**

While vicarious praise throughout struggle-stories boosted persistence more than any other strategy, additional comparisons were needed to determine if roleplaying was more effective than struggle-stories alone or control narratives. For the puzzle, children who listened to struggle-stories and engaged in a roleplaying activity persisted, on average, 39 seconds less than children in the control group (p = .33, d= .14, see Tables 9 and 10) and 56 seconds less than
children in the motivational condition (p = .16, d= .26). These findings were not statistically significant. For the search task, participants in the roleplaying condition persisted, on average, for 38 seconds more than children in the control condition (p = .21, d= .36) and 8 seconds more than participants in the motivational condition (p = .79, d= .08). Again, these results were not statistically significant. Therefore, these results suggest that the addition of roleplaying to motivational storybooks is not an effective strategy to promote persistence on difficult tasks for preschoolers (RQ3).

These results did not differ after controlling for challenge-seeking scores, school, age, character likeability (male and female), storybook likeability (both stories), perceived character intelligence (male and female), number of penguins found during the post-intervention, and number of penguins found in the first minute during the post-intervention.
Chapter 4: Discussion

Given the time-consuming and challenging nature of problem-solving, it is inevitable that children will make mistakes and experience failure. Since roughly half of children exhibit a helpless response to failure, it is critical to develop new strategies and interventions that remediate these responses and encourage persistence on challenging tasks (Dweck, 2000). By integrating social learning theories with persistence-based research, this dissertation developed an age-appropriate storybook intervention that demonstrated how sustained effort towards a difficult goal and the use of multiple problem-solving strategies are essential to goal-achievement despite moments of adversity. This research also investigated the use of vicarious praise and roleplaying, as supplementary strategies, to increase the effectiveness of these narratives on persistence in early childhood.

4.1 Summary of Findings

Although children who heard struggle-stories demonstrated greater persistence on challenging tasks compared to those who heard non-struggle stories, the difference was not statistically significant. In other words, struggle storybooks alone may not be an effective intervention to increase persistence in early childhood. This finding is not entirely surprising given the young age of the present study’s participants and their nascent developmental capabilities. Narrative comprehension requires several skills, including a sensitivity to narrative structures and the ability to make causal inferences (Graesser, Millis, & Zwaan, 1997; Graesser, Singer, & Trabasso, 1994; Kintsch & van Dijk, 1978; Van den Broek, 1990; Van Dijk & Kintsch, 1983). Although previous research suggests preschoolers are sensitive to the underlying structure of narratives and can comprehend complex stories (Lynch, van den Broek, Kremer, Kendeou,
White, & Lorch, 2008), they are also less sensitive to causal structures than older children and adults (Van den Broek, 1990), which can hinder their ability to make inferences about abstract causality (Thompson & Myers, 1985). While the struggle-stories in this intervention used concrete examples when possible, the underlying relationship between effort (and strategy-use) and success was inherently abstract. Therefore, even if storybook characters modeled growth mindsets and promoted effort-based attributions, preschoolers may not have been able to learn the abstract relationship between hard work and achievement. Qualitative findings support this theory, as more children who read the struggle-stories reported learning about failure in the storybooks (concrete events; 41%) compared to the importance of effort in problem solving (an abstract relationship; 36%). This perceived lack of a linkage between persistence on an abstract level and the practical application of these strategies to transfer tasks may account for why the struggle-stories on their own were not effective at increasing preschoolers’ persistence.

As a result, recognizing it may be difficult for children to learn a mastery-response to failure through the storybooks alone, this dissertation also explored the effects of using additional strategies in combination with these narratives, such as vicarious praise and roleplaying. Children who heard researchers praise storybook characters’ effort and strategy-use in the struggle-stories demonstrated significantly greater persistence on both challenging transfer tasks than children who heard non-struggle narratives, only struggle-stories, or struggle-stories in combination with roleplaying. They reported learning more about the importance of effort in problem solving (46%) than failure (33%) compared to the other children who heard the struggle-stories without praise (i.e., children in the motivational and roleplaying conditions). These findings suggest that vicarious praise may play a critical role in how effectively children
learn from struggle-stories and, in turn, how children apply these learnings to situations where persistence is required to succeed.

There are several reasons why vicarious praise enhanced persistence. First, vicarious praise may have helped support narrative comprehension by drawing attention to key story elements and demonstrating causal linkages among components of the plot. Given the abstract relationship between effort and success, explicitly praising characters for their hard work may have supported preschoolers’ inferencing skills and helped them understand the causal relationship between effort and achievement (i.e., effort-based attributions). Furthermore, previous research indicates that causal inferences are better remembered than non-causally related events and become part of an individual’s memory of the narrative, along with the presented plot points (Black & Bern, 1981; Seifert, Robertson, & Black, 1985). In other words, children who heard praise may have been more likely to understand and remember how sustained effort can lead to success despite initial setbacks, which as a result helped to promote the adoption of a growth mindset and mastery-oriented response to failure. Second, vicarious praise may have provided important feedback about which behaviors children should adopt and practice in their own lives. By praising storybook characters for certain behaviors (e.g., effort, hard work, strategy-use), children may be motivated to mimic these same behaviors in the hopes of also receiving praise; however, this would be a more likely explanation if the measures of persistence (puzzle & search and find) were more similar to the storybook problems (e.g., climbing a tree).

It is also important to note that while vicarious praise enhanced persistence on challenging tasks, it did not encourage fruitless persistence on the impossible task. In other words, the strategy to combine struggle-stories with vicarious process-praise created an effective
intervention to increase persistence in early childhood for achievable tasks without encouraging unproductive effort on unattainable missions.

Although vicarious praise demonstrated a positive influence on preschoolers’ persistence, child-led roleplaying was less successful, despite previous literature illustrating its impact on narrative comprehension and the proceduralization of abstract concepts. Given this finding was contrary to the original hypothesis and previous research on embodied cognition, the researchers conducted an informal post-hoc analysis of roleplaying behaviors. During data collection, researchers documented the general actions and verbiage children used during the roleplaying activities. While these were imperfect records, researchers reviewed these qualitative descriptions and found that none of participants acted out moments of failure or struggle. Rather, children tended to reenact successful strategies from each narrative; unsuccessful strategies in the story were either ignored or reconstructed into successful strategies (e.g., using a trampoline to climb a tree was unsuccessful in the story, but some children pretended to use a trampoline to successfully climb a tree). Previous work by Black and Bower (1980) may help explain why children only roleplayed successful actions and not unsuccessful attempts. Their research suggests storybooks are generally interpreted as problem-solving protocols, where different actions are classified into a hierarchy based on how important they to helping a character reach the end state. Therefore, successful problem-solving actions are seen as superordinate and are more likely to be remembered than failed or incomplete attempts. As a result, when children were asked to roleplay the storybook after each reading, they may have gravitated towards the actions they remembered better (i.e., the successful strategies) rather than ones they were more likely to forget (i.e., the unsuccessful attempts). Given the open-ended nature of the roleplaying activity, where researchers did not suggest specific actions to reenact, children ended up
practicing success, rather than proceduralizing persistence in the face of failure. Thus, the addition of this non-directed roleplaying activity did not further enhance a mastery-oriented response to failure, promote effort-based achievement attributions, or lead to increased persistence.

4.4 Implications

This dissertation provides additional support to the well-documented social-learning theory (e.g. Bandura) and motivation literature (e.g. Dweck). Several researchers throughout history have demonstrated how young children are capable of learning behavior, attitudes, and beliefs from models in their environments. This dissertation not only extends the research by Lin-Siegler, Ahn, Chen, Fang, and Luna-Lucero (2016) to support the use of struggle stories in early childhood as an effective intervention to increase persistence, but also expands upon the research by Master (2011) to demonstrate how these narratives can support transfer. Practical implications for this work include the consideration of using process-praise towards characters, when reading storybooks with young children.

4.3 Limitations and Future Directions

Additional research is both important and necessary to further understand why the use of vicarious praise in combination with the struggle-stories increased preschoolers’ persistence. While this dissertation presents some qualitative data that suggest vicarious praise helped children learn the importance of effort in problem-solving, additional research and measurements are necessary to understand the full story. For example, researcher may want to conduct in-depth interviews after readings the storybooks to determine how children attribute character success and failure throughout the stories. Are children merely noticing that effort is part of the learning
process, or rather do they perceive effort as the driving force in successful outcomes? Additional work may also want to compare preschooler attributions before and after the intervention sessions to determine whether they are more or less likely to attribute success or failure to internal explanations (e.g., effort, ability). It is quite possible that struggle-stories may not influence attributions at all, but rather provide a general schema or blueprint for how to solve problems.

Although child-led roleplaying allowed for natural engagement, it was also a fundamental limitation as an interventional strategy as children gravitated towards reenacting success, rather than persistence through failure. Future research could explore ways to effectively structure child-led roleplaying that prompts preschoolers to enact persistent or effortful behavior, rather than successful strategies alone. Alternatively, child-directed roleplaying may have fundamental limitations for preschool aged children, but this could be a more effective intervention strategy for older children who can more easily comprehend morals of stories and may naturally reenact non-successful strategies.

It is also important to consider the implementation and scalability of this intervention. While this dissertation created specific struggle-stories and non-struggle narratives, commercially available storybooks may be just as effective and easier to implement. Many storybooks depict moments of failure and sustained effort on tasks; thus, future research could explore how praising characters in commercially available storybooks who demonstrate persistent behavior can influence persistence. Furthermore, it would be interesting to compare the effects of praising unknown characters (such as the ones in this dissertation) to characters that are already well-known and liked by preschoolers. Would feeling a greater connection to the storybook characters support an increased understanding how persistence is related to
achievement? Or would prior knowledge and a proclivity towards these characters distract from the deeper, abstract lessons of persistence? Future research could also explore different implementation strategies such as experimenting with the number of reading exposures, the length of the intervention, small or large group settings, or alternate readers (e.g., parents or teachers, rather than researchers). This dissertation only used two measurements to measure positive persistence, but future researchers may want to look at other measures of persistence, such as self or teacher reports.

4.4 Conclusion

This dissertation provides evidence to support the use of struggle-stories narratives in early childhood to increase persistence on challenging tasks. Children demonstrated the capability to learn messages about persistence from storybook models and to transfer this understanding to failure-inducing tasks, when characters were praised for their effort and use of multiple strategies throughout the narrative. Given the importance of developing a mastery-oriented response to failure in early education, this dissertation provides insight in developing an age-appropriate intervention to increase persistence.
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Steinmayr, R., & Spinath, B. (2009). The Importance of Motivation as a Predictor of School


Appendix A

Reading Guides

Rocks That Roll (Control ~147 words)

1. Ellie is sliding quickly down the hill—look at her hair blowing in the wind! Harry is rolling quickly behind her.
2. Harry and Ellie are covered in blueberries! They look like giant blue blobs. I can barely see Ellie's feet underneath all the berries.
3. How do you think Ellie and Harry are feeling? Why do you think they are feeling [insert from child]?
4. Oh no! It's starting to rain, look at all the puddles! Ellie and Harry are getting very wet, I hope they can find shelter soon.
5. What do you think will happen next?
6. Ellie and Harry had so much fun playing outside! First, Harry rolled while Ellie slid down the hill, then they both used blueberries to bounce, and finally, Harry used mud to help Ellie roll down the hill with him! They had so much fun playing together.

Rocks That Roll (Motivational and Roleplaying, ~157 words)

1. Hmm, Ellie still can't roll down the hill, even when Harry gave her a big push. She's just sitting on the hill, not rolling.
2. Ellie is bouncing high into the sky, not rolling down the hill like Harry! Even though the blueberries are round like Harry, they aren't helping Ellie roll.
3. How do you think Ellie and Harry are feeling? Why do you think they are feeling [insert from child]?
4. Wow! What a big pile of mud! It looks like they are going to use the mud to make Ellie round, so she can roll like Harry down the hill.

5. Yay! Ellie is rolling down the hill, just like Harry! Together, Ellie and Harry were able to figure out a way to help Ellie roll down the hill— even when pushing Ellie and using blueberries didn't work. Now, they can have fun rolling down the hill together in the rain!

**Rocks That Roll (Praise ~ 151 words)**

1. Harry doing a great job trying to help Ellie roll, even though pushing her didn’t work.

2. It’s great the rocks keep trying new ways to help Ellie roll, but it looks like the blueberries only make Ellie bounce! I am glad Ellie and Harry are trying really hard to help her roll.

3. How do you think Ellie and Harry are feeling? Why do you think they are feeling [insert from child]?

4. I am proud that Ellie and Harry aren't going to give up and will try using mud to help Ellie roll. They are doing a great job working hard!

5. What do you think will happen next?

6. The rocks tried many different ways to help Ellie roll down the hill that didn’t work like using blueberries and pushing Ellie really hard down a hill. But I am glad they didn’t stop trying until they found a way that worked! Ellie and Harry did a great job working hard to help Ellie roll!

**John and June Climb a Tree (Control ~168 words)**

1. What do you think will happen next?
2. John and June both climbed up to the first branch of the tree! They were able to use their arms and legs to wiggle up the trunk and now they can see into their neighbor's yard! It looks like their neighbor, Jerry, left a pink floatie in his pool.

3. John and June were really careful when they climbed up to the next branch. If they weren’t careful, they could have accidentally knocked the nest out the tree or broke one of the eggs.

4. How do you think John and June are feeling? Why do you think they are feeling [insert from child]?

5. They are really brave for climbing so high up the tree!

6. John and June had a really fun time climbing the new tree in their backyard! Together they wiggled from the bottom of the tree to the first branch, then to the second branch, and all the way up to the third branch!

**John and June Climb a Tree (Motivational and Roleplaying ~163 words)**

1. What do you think will happen next?

2. John wasn’t able to climb the tree using his hands and feet. He fell off the tree and landed on the ground, but luckily he didn’t get hurt. John and June need to be really careful when they are climbing trees!

3. June jumped really high on the trampoline, but she still couldn't reach the branch. It looks like she got pretty close to the branch, but it’s just too high up.

4. How do you think John and June are feeling? Why do you think they are feeling [insert from child]?

5. I hope John and June can find some rope in their garage, so they can use it to climb the tree!
6. John and June finally climbed the tree! Even though their hands and feet didn’t work, nor the trampoline, nor standing on top of one another, they were able to use a ladder to help them reach the first branch. Now they can sit up in the tree and look out into the distance!

**John and June Climb a Tree (Praise ~165 words)**

1. What do you think will happen next?

2. John did a great job trying to climb the tree using his hands and feet, even though it didn’t work.

3. It’s great June tried another way to climb the tree using the trampoline, but she couldn’t jump high enough to reach the branch. I am glad they are working hard and trying different ways to climb the tree. They are doing a great job!

4. How do you think John and June are feeling? Why do you think they are feeling [insert from child]?

5. Even though they couldn’t climb the tree using their hands and feet, the trampoline, or standing on top of one another, John and June are doing a great job trying to climb to the first branch.

6. John and June tried many different ways to climb the tree, but finally the ladder helped them reach the tall tree branch! They did a great job working hard and not giving up!

**Roleplaying Guides**

**Rocks That Roll**

“Let’s pretend you are either Ellie or Harry from the rock book, which one would you like to be?”
“Great! Imagine you are [insert child’s response], what kinds of things would you do? Show me!”

**John and June Climb a Tree**

“Let’s pretend you are either John or June from the tree book, which one would you like to be?”

“Great! Imagine you are [insert child’s response], what kinds of things would you do? Show me!”

**Additional Prompts for Either Book:**

“What else would [insert child’s response] do?”

“What kinds of things did [insert child’s response] do in the story? Show me!”

“Try to make pretend using your body.”
## Appendix B

### Character Likeability Means

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### Perceived Character Intelligence Means

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