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Motivation Orientation and School Readiness in Children Served by Head Start

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UNIVERSITY OF MIAMI

MOTIVATION ORIENTATION AND SCHOOL READINESS IN CHILDREN SERVED BY HEAD START

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Embracing challenges and coping with setbacks broadly characterize a set of skills known as motivation orientation. Smiley and Dweck (1994) define two types of motivational orientations (MO): mastery motivated orientation (MMO) and performance motivated orientation (PMO). The former is characterized by viewing failure as an opportunity for growth while the latter views failure as a confirmation of negative self-attributions. How and when these MO's develop and can be fostered as well as how they operate in preschool and low-income contexts, however, remains unknown. This project extends the literature by examining the relationships between MO and school readiness outcomes in preschoolers from low-income families. Of the 334 children assessed, 77% endorsed a MMO, and 23% a PMO. The measure of MO showed poor to fair stability overall (Cohen's Kappa=.39), however, MMO was more stable (r=.90) than PMO (r=.51) within the re-test sample. While the previous finding that children who endorse a MMO made significantly fewer negative evaluations of their ability was replicated, no significant relationships between MO and school readiness outcomes were found. Results highlight potential limitations in the measurement of MO for preschooler from low-income families. Future research should focus on exploring this issue and creating sensitive and developmentally appropriate direct assessments of MO so young children with maladaptive motivational skills can be reliably identified and targeted for intervention.

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CHAPTER 1: INTRODUCTION

There is an academic achievement gap between children from low-income families and their middle to high-income counterparts (Hart & Risley, 1995; Walker, Greenwood, Hart, & Carta, 1994). Evidence indicates that this disparity begins early, as observable differences in school readiness exist prior to children beginning kindergarten (Magnuson & Duncan, 2006), and persist through later grades (National Assessment of Educational Process [NAEP], 2009). In other words, children from low-income families enter school less prepared to succeed, and are at greater risk of having difficulty adjusting to elementary school because of the many hazards associated with living in poverty (Duncan, Brooks-Gunn, & Klebanov, 1994). Given these realities, research that identifies and fosters skills that promote school readiness needs to be conducted with children who live in poverty in order to narrow this achievement gap.

Disparities in academic achievement during the preschool years span multiple developmental areas commonly referred to as school readiness domains (Magnuson & Duncan, 2006), which help young children adjust to the demands and expectations of grade school (Lewit & Baker, 1995). At the national level, five domains of school readiness have been identified: 1) physical well-being and motor development, 2) social and emotional development, 3) language development, 4) cognition and general knowledge, and 5) approaches to learning (Kagan, Moore, & Bredekamp, 1995). Approaches to learning is the least understood, the least researched, but arguably the most important of these 5 readiness domains (Kagan et al., 1995, p. 21).

Research highlights the importance of teachable and malleable skills, especially those skills that impact multiple school readiness domains, for children from low-income families. These skills, often referred to as domain-general skills because they can

contribute to learning in multiple domains of school readiness, play a central role in predicting academic attainment (Li-Grining, 2007; McClelland et al., 2007). Approaches to learning is a set of teachable and malleable domain-general skills that encompasses motivation and persistence, as well as strategies and attitudes towards learning (Fantuzzo, Perry, & McDermot, 2004).

Approaches to learning skills provide ways for young children to optimize learning by setting goals, planning, and revising their behaviors throughout the learning process (Urdan & Schoenfelder, 2006). This is an iterative process, replacing realized goals with increasingly difficult goals in order to continue developmental progress (Bransford, Brown, & Cocking, 1999). By definition, challenging goals will lead children to make errors and suffer setbacks. High performing students are able to avoid discouragement and seek out future challenges. Taking on difficult tasks and persisting despite setbacks are adaptive approaches to learning skills, that aid children in improving their achievement across multiple school readiness domains (Stipek, Newton, & Chudgar, 2010; Li-Grining, Votruba-Drzal, Maldonado-Carreno, & Haas, 2010; Fantuzzo, Perry, & McDermott, 2004).

Another domain-general construct that is conceptually related to approaches to learning, and has potential to positively influence school readiness and academic success, is motivation orientation (MO). Smiley and Dweck (1994) define two types of MO's: mastery motivated orientation (MMO) and performance motivated orientation (PMO). A MMO involves positive affect during challenging tasks, self-motivating statements, a focus on effort and strategies, persistence, and high expectations for future performance success. Conversely, a PMO involves negative affect during challenging tasks, negative

self-attributions of ability, lack of persistence, and low expectations for future performance success. Although there are currently no studies that examine the relationships between approaches to learning and MO, the two constructs share various core components, such as tolerance for frustration and failure, persistence, and the motivation to approach and succeed in challenging tasks (Smiley & Dweck, 1994; Fantuzzo, Perry, & McDermott, 2004).

The importance of motivation and persistence is particularly salient for children from low-income families. Preschoolers from low-income families have been shown to have lower persistence in the face of academic challenge (Brown, 2009). Similarly research has shown that direction, intensity, persistence, and quality of children's behavior demonstrated in a learning context, also referred to as achievement motivation, is highly associated with family and neighborhood income (Maehr & Meyer, 1997; Brooks-Gunn, Linver, & Fauth, 2005). Zigler and Seitz (1980) recommend that interventions aimed at improving motivation should be targeted for low-income families that are at higher risk for negative motivational patterns.

Research has demonstrated that MO is a malleable construct that is sensitive to intervention and has a direct relationship to academic outcomes in middle-school aged children (Blackwell, Trzesniewski & Dweck, 2007). Studies on MO have also been conducted with preschoolers from low-income families, demonstrating that the construct is relevant and applicable to children as young as three years old (Brown, 2009; Day & Burns, 2011). Welsh et al. (2010) conducted a longitudinal study including 164 children served by Head Start, and found that growth in domain-general cognitive skills during preschool made unique contributions to the prediction of kindergarten math and reading

achievement. Given the domain-general nature of MO, and its relevance for preschool children, the literature would benefit from research that examines the relationship between MO and school readiness.

Therefore, the current study examined MO's of children served by Head Start and their relation to gains across the school year in multiple domains of school readiness, including emergent literacy, numeracy and science, as well as examining the relationship between MO and approaches to learning. The current study had three aims:

1. To examine the distribution and stability of MMO vs. PMO in a sample of children enrolled in Head Start. It was hypothesized that children who utilize MMO and PMO's will be equally represented and both will be equally stable in the sample. Previous research shows that preschool children from low-income families endorse a MMO close to 50 percent of the time. Stability has yet to be examined in the current measure (Brown, 2009; Day & Burns, 2011).
2. To examine the relationship between MO and approaches to learning. It was hypothesized that children who utilize a MMO will be rated higher by their teachers on a measure of approaches to learning. Motivation and persistence are both key construct in MO and approaches to learning (Smiley & Dweck, 1994; Fantuzzo, Perry, & McDermott, 2004).
3. To examine the relationship between MO and school readiness outcomes (e.g., early literacy, mathematics, and science skills). It was hypothesized that children who utilize a MMO will experience greater gains in school readiness outcomes over the school year as compared to children who utilize a PMO. Research with older children suggests that children who endorse a MMO

show larger gains across the school year in mathematics (Blackwell, Trzesniewski, & Dweck, 2007). A MMO in preschool children has also been shown to correlate with attention and persistence, skills that are both critical for academic success (Chang & Burns, 2005; Brown, 2009).

Background and Significance

Motivation Orientation

There are a range of MO's, often called "achievement motivation patterns," that describe the way children respond to challenge (Dweck & Leggett, 1988; Elliot & Thrash, 2001). Carol Dweck's (2006) "Mindset" theory defines two types of behavior patterns that characterize how people approach challenges and how they rationalize setbacks and failures during challenging tasks. One approach, typically referred to as MMO, holds that intelligence is malleable and independent of one's intrinsic ability; everyone has the potential to improve and excel in any area with proper preparation and effort. Therefore, when MMO individuals encounter a challenging task they view it as a chance to improve themselves and expand their abilities. Individuals with a MMO embrace challenges, persist in the face of setbacks, view effort as a path to mastery, and utilize the feedback of others (Cain & Dweck, 1995).

The other approach, referred to as a PMO, holds that intelligence is a fixed trait determined by innate ability level. Individuals with this approach believe they should stick to the areas where they are gifted, and avoid areas where they are not naturally adept. Therefore, when these individuals encounter a challenging task they evaluate their initial performance (fail or succeed) as a reflection of their fixed, innate ability. Individuals with a PMO, avoid challenges, are discouraged by setbacks, view effort as a

lack of intelligence, and are not able to successfully incorporate feedback from others (Cain & Dweck, 1995).

At the time Dweck and colleagues were formulating the definitions of MMO and PMO, it was the prevailing view that the motivational patterns that are at the root of the PMO, did not emerge until late childhood (Dweck, 1991). For this reason the language used to describe these two behavior patterns was intended for older children and adults. Subsequently, in the context of preschool studies, Smiley and Dweck (1994) defined a MMO as involving positive affect during challenging tasks, self-motivating statements, a focus on effort and strategies, persistence, and high expectations for future performance success. Conversely, a PMO was defined as involving negative affect during challenging tasks, negative self-attributions of ability, lack of persistence, and low expectations for future performance success.

To adopt an attitude of high motivation and persistence, a child benefits from adults who can encourage effort, guide and assist the navigation of novel tasks that are beyond the child's ability, and praise the child's effort and preparation along the way (Mueller & Dweck 1998). Children who live in poverty get less individual attention from adults and have fewer opportunities to participate in quality early educational experiences (National Association for the Education of Young Children, 1996; Shonkoff & Phillips, 2000). Research suggests that preschool is a critical period for the development of the mental processes that support goal-oriented approaches to learning, and that these processes are often delayed in children growing up in poverty (Noble, McCandliss, & Farah, 2007).

Motivation Orientation and Theoretical Considerations

A MMO can be seen as adaptive through multiple theoretical lenses. Life course theorists would suggest that children who utilize a MMO would benefit from "cumulative advantage" (DiPrete & Eirich, 2006). "Cumulative advantage" is the notion that the methods children use to approach learning activities during early childhood result in advantages that grow over time (Li-Grining et al., 2010). Children who adopt adaptive motivational approaches to learning have a better chance of developing a solid foundation of academic skills that lead to an improved academic trajectory and the attainment of more advanced skills throughout their academic career.

According to Vygotsky, children have to navigate through "zones of proximal development" in order to reach developmental milestones and maximize their learning potential. These "zones of proximal development" are comprised of developmentally appropriate levels of functioning that children have to explore and eventually master (Vygotsky, 1978). Regardless of MO, children rely on adults or older peers to help guide them through these zones of development. The optimal process involves more knowledgeable individuals pushing children to operate at the upper limits of their current zone, and scaffolding the learning process by assisting the child in using more advanced cognitive techniques than the child could subsequently utilize independently. The child will eventually master these new cognitive processes and conquer increasingly difficult developmental tasks, first with the help of someone more knowledgeable and then on their own (Vygotsky, 1978). Given the attitude towards failure and the preference for challenge associated with the MMO it is likely that children who embody this approach

will be more receptive to scaffolding, and more likely to embrace challenges on the upper end of their "zone of proximal development" than children who utilize a PMO.

Although adults and more advanced peers do play a large role in development, autonomous exploration is a critical component. Piaget's constructivist theory considers a child's exploration of their environment essential for development because they search for new knowledge and reorganize their mental schemas based on the information they attain (Piaget & Inhelder, 1969). This exploration gives them a new, more insightful perspective of their world and allows for developmental growth (Piaget, 1983). Children who utilize a MMO are more likely to explore their environment and seek novel situations because they view them as learning opportunities, whereas children who utilize a PMO may be more apprehensive about exploring new areas due to their desire to avoid failure.

Review of the Literature on Motivation Orientation

Research on MO suggests that preschool age children already have an internalized investment in either the evaluation of their achievement or in the process of learning; the investment in evaluation or process can determine how children approach challenging tasks (Burhans & Dweck, 1995; Ames, 1992; Gilmore, Cuskelly & Purdie, 2003). Smiley and Dweck (1994) separated preschool children from middle-income families into two groups by their MO; using the Mastery Motivation Puzzle Task (MMPT; refer to "Method" section for a review of this measure). Out of the 78 subjects, 33 (42%) were considered PMO, and 45 (58%) were considered MMO. The MMO group expressed significantly less performance worries, were more engaged in the task, reported more positive emotion, made higher self-evaluations of puzzle ability following failure, and

expressed higher confidence in future success with puzzles than the PMO group (Smiley & Dweck, 1994). Subsequent research has shown that a MMO serves as a protective factor and is associated with improved achievement outcomes for older children and young adults (Dweck, 2008; Skinner & Belmont, 1993).

Motivation Orientation in Low-Income Children

A few studies have investigated the construct of MO in preschoolers from low-income families and have found that MMO associated factors such as persistence and preference for challenge are correlated with improved scores on achievement tests, and other skills important for academic success (Stipek & Ryan, 1997; Howse et al., 2003). One study to date has investigated the relationship between MO and school readiness in a low-income population. Turner and Johnson (2003) tested a theoretical model of MO in at-risk preschoolers, finding that children's MO predicted performance on academic achievement tests when controlling for pretest differences. However, their measure of MO had only three items, and it was filled out by teachers and parents. The correlation of the parent and teacher reports of MO was small ($r = .15$) and not statistically significant. Additionally, the alpha coefficient for the six items (three parent and three teacher items) was .56. Despite the questionable reliability of the measurement of MO in this study, the authors did find a significant relationship between MO and school readiness that included language and number skills. A replication of these results with a direct assessment of MO would strengthen these findings.

Day and Burns (2011) examined MO in preschool children from low- and middle-income families in order to draw comparisons between the two groups. The sample consisted of 126 preschoolers half of which came from Head Start centers and the other

half from a private preschool. The children were administered the MMPT and their verbalizations during the task were recorded. Results indicated that 54% (N=69) of children were MMO and after controlling for age, and puzzle ability, family income did not predict MO. However, further analysis showed that during the puzzle task, children from low-income families made significantly more performance-related verbalizations, concerns, and negative self-evaluative statements, than children from middle-income families.

Eleanor Brown (2009) administered the Mastery Motivation Puzzle Task (MMPT) to 103 children served by Head Start. Results showed that approximately 50 percent of children utilized a MMO, and this orientation significantly predicted persistence in the face of challenge. Research conducted with children from middle-income families; on the other hand, reports approximately 60 percent of children utilize a MMO (Burhans & Dweck, 1995; Cain & Dweck, 1995; Smiley & Dweck, 1994). Given these inconsistent findings additional research is needed to understand why children from low-income families seem to be utilizing a MMO at a lower rate in some studies while other studies only show differences in relevant verbalizations. The current study explores the construct of MO in preschoolers from low-income families and employs a sample size three times larger than any study examining MO in preschool children to date.

Motivation Orientation and Approaches to Learning

Li-Grining, et al., (2010) followed a sample of 10,666 children through kindergarten, 1st, 3rd, and 5th grade and found a positive link between early approaches to learning and individual trajectories of reading and math performance. Similarly, measures of persistence and attention regulation have been correlated with higher scores on reading

and math assessments (Fantuzzo, Sekino, & Cohen, 2004), and global measures of approaches to learning have been associated with better vocabulary, literacy, and math skills (Fantuzzo et al., 2007). Despite the many similarities between MO and approaches to learning, there are no studies to date that examine MO as it relates to approaches to learning. Due to the strong evidence that approaches to learning is a valuable construct for preschool aged children from low-income families, demonstrating a relationship between approaches to learning and MO would lend support for further investigation of MO in young children from low-income families.

Malleability of Motivation Orientation

MO has also been shown to be malleable and susceptible to intervention. Blackwell, Trzesniewski and Dweck (2007) conducted an 8 week intervention aimed at instilling MMO in an ethnically diverse, largely low-income, sample of middle school children. A significant increase in endorsement of MMO attitudes from pre- to post-intervention was observed in the experimental group and not in the control group. Additionally, children in the control group who endorsed a PMO experienced a decline in grades that is commonly observed during the transition to middle school (Gutman & Midgley, 2000). Conversely, children in the experimental group who at pre-test endorsed a PMO showed the largest gains in their grades pre- to post-intervention. The authors (Blackwell, Trzesniewski & Dweck, 2007) also reported on a longitudinal study of 373 children entering middle school who were assessed on their MO. The group that endorsed a MMO at the beginning of middle school saw steady improvements in their math grades across a two year span, whereas the group that endorsed a PMO experienced small declines at each time point.

While interventions among middle school aged children have shown great promise, their techniques are not appropriate for preschool aged children. The interventions previously mentioned were centered largely on neurobiology. These interventions focused on showing children that the brain makes new neural connections during the learning process; thus intelligence is malleable and challenges should be met with enthusiasm instead of fear. This type of biological approach is beyond the cognitive ability of a four year old. However, conducting developmentally appropriate MO interventions in preschool aged children is a realistic undertaking. However, in order to create effective interventions, research is needed to further understand MO in preschoolers from low-income families, and how it relates to approaches to learning and academic school readiness.

The Role of Praise in Motivation Orientation

One construct that can be manipulated is praise; there is evidence to suggest that MO is associated with the amount and style of praise children receive (Dweck, 2006). Research indicates that praising a child for their ability (i.e. “you’re so smart” “you’re so talented”) after success can reinforce the notion of contingent self-worth, because if success indicates intelligence, failure must be indicative of a lack of intelligence. The more MMO approach is to praise children for their effort and preparation (i.e. “you must have tried really hard” “you spent a lot of time getting ready for this”) after success. Children ranging from pre-school to fifth grade praised for intelligence have been shown to display less task persistence, less task enjoyment, more low-ability attributions, and worse task performance than children praised for effort (Mueller & Dweck 1998; Kamins & Dweck, 1999). The concept of praise is of particular importance for children from low-

income families because they receive less praise and more negative comments than middle to high income children (Chang & Burns, 2005).

Current Study

Results from the studies discussed above suggest that the construct of MO is relevant to children from low- and middle-income families, and all preschool children regardless of family income level are vulnerable to maladaptive motivational styles. However, previous research has shown that children from low-income families seem to endorse a PMO at slightly higher rates, and express more negative verbalizations in the face of challenge, than their middle-income peers (Brown, 2009; Day & Burns, 2011). Given these results, further research on MO in children from low-income families is needed to support the scant literature examining these constructs, as well as, to gather information that can inform future developmentally appropriate interventions.

The current study examined MO in a sample of children served by Head Start in Miami-Dade County. Data were collected to examine the associations between MO and school readiness outcomes including early literacy, mathematics, and science skills. In addition, associations between MO and approaches to learning were examined (see page 6 for research aims and hypotheses).

CHAPTER 2: METHOD

Participants

Subjects were 334 children selected from Head Start centers in Miami-Dade County. Children were stratified by age and gender to achieve a representative sample of the local population. The sample was comprised of predominantly African American (71%) and Latino children (27%), was 51% female, and ages ranged from 36 to 59 months (M=48). All children met the federal income requirement for enrollment in Head Start indicating a sample of children from low-income families. The re-test sample was comprised of 113 children and was stratified by MO on first assessment and gender, 51% of re-test sample originally endorsed a MMO and 49% originally endorsed a PMO. The re-test sample was representative of the larger sample in ethnicity (69% African American and 28% Latino), gender (54% female), and age (range of 36 to 59 months, M=49).

Measures

Academic School Readiness. Learning Express (McDermott, Fantuzzo, Waterman, Angelo, Warley, Gadsden, et al., 2009) is an academic direct assessment designed and validated specifically for low-income, at-risk preschool children. Children are assessed individually by a trained assessor using a large flip-book of pages that depict pictures, letters, and/or numbers. The test has four subscales that are administered in the following order: Vocabulary (58 items), Mathematics (57 items), Listening Comprehension (37 items), and Alphabet Knowledge (52 items). The two available forms (A and B) were counterbalanced (i.e., half of the children received form A first, followed by form B and vice versa). Each form includes a set of items ordered by difficulty, and each item is scored as either correct or incorrect. Raw scores are converted to an interval-

level score according to Item Response Theory (IRT) analysis. Reliability across subscales ranges from .93 to .98. External and predictive validity was established for all subscales (McDermott et al., 2009).

Lens on Science assessment (LENS; Greenfield et al., 2011) is a computer-adaptive, IRT-based direct assessment of science knowledge and content skills. This assessment was specifically designed to detect growth in the Head Start population. Items were created based on a review of preschool and kindergarten state and national standards as well as current preschool science curricula. The assessment was designed to cover a range of difficulty appropriate for Head Start preschoolers, as well as a range of science practice skills, cross-cutting concepts and science content from "life science," "earth and space sciences" and "physical and energy sciences".

Children are placed in front of a touch-screen monitor and given headphones to listen to prompts instructing them to respond. A trained researcher supervises the test administration process. An IRT ability score is obtained in approximately fifteen minutes with the administration of approximately 35 – 40 items. The assessment currently contains an item bank of 389 items calibrated using the dichotomous Rasch model scaled to have a mean item difficulty of zero and unit-logit metric. Item difficulties (*b*-parameters) range from -2.7 to 4.4, with 80% of items having difficulty values between -1.40 and 1.42. The item-measure correlation (correlation between the item and the ability estimate) exceeds .20 for 87% of items, and exceeds .30 for 65% of items, reflecting effective discrimination of the items in the bank and evidence of a common trait measured by the items of the assessment. For a sample of 1,753 students, the average

standard error of the Rasch ability estimate was 0.31 (on the unit-logit metric), which corresponds to a reliability of .87 (Greenfield et al., 2012).

Approaches to Learning. The Learning-to-Learn Scales (LTLS; McDermott, Fantuzzo, Warley, Waterman, Angelo, Gadsden, & Sekino, 2010) is a measure of approaches to learning and learning related behaviors. The LTLS is a teacher-completed scale with 55 items rated on a three point Likert scale ("consistently applies"; "sometimes applies"; "does not apply"). Teachers are asked to answer questions thinking about each child's behaviors during the past month. Exploratory factor analyses revealed a general factor as well as seven dimensions: Strategic Planning, Effectiveness Motivation, Interpersonal Responsiveness in Learning, Vocal Engagement in Learning, Sustained Focus in Learning, Acceptance of Novelty and Risk, and Group Learning.

Motivation Orientation. The Mastery Motivation Puzzle Task (MMPT; Smiley & Dweck, 1994) was used to assess MO. The task employs a set of puzzles to assess children's MO. All included puzzles have 24 pieces. In order to make the puzzle developmentally appropriate 16 of the pieces are glued down, leaving only eight for children to manipulate. Three of the puzzles are made unsolvable by swapping out three of the eight pieces for similar pieces that do not fit.

Assessment takes place over two sessions within a week. During the first session participants complete a pretest puzzle to establish baseline puzzle ability; the amount of time taken by the child to complete the puzzle is recorded, where higher times are indicative of lower baseline puzzle ability. During the second session participants are asked to complete three unsolvable puzzles and one solvable puzzle, participants are given two-minutes to complete each of the unsolvable puzzles and unlimited time to

complete the solvable one. Upon completion of the final puzzle children are told "You can do one of these again. Which one would you like to do?" After the child selects a puzzle they are told "Good choice. Why did you pick that puzzle?" After the child's response is recorded they are given the correct pieces to the puzzle they selected and allowed as much time as they need to complete it. Children are subsequently asked, "If you had lots of time right now, could you finish any of these (unsolvable) puzzles?" Children who respond "no" are marked as low confidence and children who respond "yes" are marked high confidence. Children's verbalizations are also recorded during puzzle completion and all verbalizations are coded (see Table 4).

Children's reasons for choosing the puzzle to try for a second time are divided into one of four categories: challenge, want/like, no challenge, and no reason. Responses that indicate an interest in taking on a challenge (e.g., "Because I want to try to finish it.") are coded as "Challenge." Responses that indicate the child had an affinity for that particular puzzle (e.g., "Because I like that one.") are coded as "Want/Like." Responses that indicate an interest in avoiding challenge or selecting the easiest one (e.g., "Because that one is easy" or "Because I can already do that one.") are coded as "No Challenge." Finally, responses that indicate the child has no reason for their choice ("I don't know" or "Just because.") are coded as "No Reason" (Smiley & Dweck, 1994). Children's puzzle choice and reason for selection are used to determine their MO. Children who selected the solvable puzzle to try for a second time and children who give a "No Challenge" explanation for their choice are placed in the PMO group. Children who select one of the unsolvable puzzles and give a "Challenge," Want/Like," or "No Reason," response are placed in the MMO group.

Pilot Study to Insure Comparable Puzzle Difficulty

Although the MMPT has been used in multiple studies following the protocol described above, researchers have used a variety of different puzzles for this task. In order to ensure that the puzzles used for the present study were comparable, five puzzles featuring "Winnie the Pooh" in various scenarios (see Figure 1) were evaluated in the spring of 2012, prior to the beginning of this study. Each of these five puzzles were administered to ten (five male and five female) children ranging from three to five years old, enrolled in Head Start. Each child was given the puzzles in a different order and each of the five puzzles was presented first in the order for two different children. Children were not given any assistance in completing the puzzles and the time it took for them to complete the puzzles was recorded. The mean puzzle completion time in minutes and seconds was (M = 4:11, SD = 2:58), and the mean completion times for each of the five puzzles (3:35, 4:50, 3:39, 4:07, 4:23), were not significantly different, $F(4,36) = .73$, $p = .578$. In the majority of cases children would take the longest amount of time to complete the first puzzle administered and their times would get progressively faster on subsequent puzzles. This pilot study showed that the five puzzles are comparable to each other and developmentally appropriate for preschool aged children served by Head Start.

Procedure

Data were collected during the 2012-2013 school year as part of a larger project. Consent was obtained from teachers who agreed to participate in the larger project. The MMPT was collected in the winter of 2012 on the entire sample. Children in the re-test sample were administered the MMPT for a second time when they returned from winter break in 2013.Teachers were asked to fill out the Learning-to-Learn Scale in the winter of

2012. Children were assessed on the four subscales of the Learning Express (mathematics, listening comprehension, alphabet knowledge, and vocabulary), as well as, the Lens on Science Assessment, in the fall of 2012 and again in the spring of 2013. During the fall, the Mastery Motivation Puzzle Task, the Learning Express, and the Lens on Science Assessment were administered on three different days. Each session lasted approximately 20-30 minutes.

Analyses

Hypothesis 1: Children who utilize MMO and PMO will be equally represented and both MO's will be equally stable. In order to address the first hypothesis the frequency of endorsement of MMO vs. PMO was calculated for the full sample, as well as, Cohen's Kappa statistic to determine stability of the MMPT.

Hypothesis 2: Children who utilize a MMO will be rated higher by their teachers on a measure of approaches to learning. To address the second hypothesis a linear regression analysis was utilized to examine the independent variable (MO) as it relates to the dependent variable (approaches to learning). Race, gender, age, and baseline puzzle ability were entered as covariates.

Hypothesis 3: Children who utilize a MMO will have higher rates of improvement in school readiness outcomes over the school year, as compared to children who utilize a PMO. To address the third hypothesis multilevel modeling analyses was going to be conducted using the software HLM 7 (Raudenbush, et al., 2011). However, intra-class correlations were conducted to determine whether there was enough variability at the classroom level for this analysis to be conducted in a hierarchical framework using

Hierarchical Linear Modeling (HLM). Due to the small amount of variance at the classroom level (see intra-class correlations (ICC's) below), HLM was not used. Analyses were run using linear regressions, and separate analyses were run for each school readiness measure. MO was used to predict spring readiness scores controlling for race, gender, age, baseline puzzle ability, and the fall school readiness score.

CHAPTER 3: RESULTS

Hypothesis 1:

Of the 334 children assessed 77% (N=259) endorsed a MMO and 23% (N=75) endorsed a PMO (see Figure 2). One hundred and thirteen children were given the MMPT for a second time, 51% (N=58) who originally endorsed a MMO and 49% (N=55) who originally endorsed a PMO. Ninety percent (N=52) of the 58 children who were initially classified as MMO, maintained this classification at retesting. However, only 51% (N=28) of the children who were initially classified as PMO remained PMO at retesting. Although the overall Cohen's Kappa statistic calculated (K= .392, $p < .001$), suggests fair stability, this was a result of high stability for the MMO group and poor stability for the PMO group (see Table 1).

Hypothesis 2:

Linear regression was utilized in order to examine the relationship between approaches to learning and MO. The overall model using MO to predict approaches to learning controlling for age, race, gender, and baseline puzzle ability was significant, $F(5,292) = 17.04$, $p < .001$. However, MO did not significantly predict approaches to learning after entering the covariates into the model $t = -.86$, $p = .39$. Additional linear regressions were also conducted in order to examine the relationship between MO and the verbalizations (see Table 4) that children made during the puzzle task. MO significantly predicted "negative ability evaluations" which are statements indicating the child doubts their ability to complete the task, $F(1,36) = 9.04$, $p = .005$, indicating that

MMO children made significantly less negative ability evaluations, t = -3.01, p = .005, than their performance motivated peers(see Table 2).

Hypothesis 3:

Prior to conducting the HLM analyses, intra-class correlations were computed to determine the amount of variability at the child level and the classroom level for each measure. For the Learning Express 95.3% of the variability was at the child level and for the Lens on Science assessment 99.9% of the variability was at the child level. Due to the low level of variance at the classroom level the HLM approach did not offer a distinct advantage over linear regression, therefore, analyses including the Learning Express and the Lens on Science assessment were conducted using linear regressions. The first model using MO to predict spring science scores, controlling for fall science scores, age, race, gender, and baseline puzzle ability was significant, F(6,289) = 36.06, $p < .001$. However, MO was not a significant predictor of spring science scores, after entering the covariates in to the model, t= -1.66, p = .097 (see Table 3).

The next four models examined the subscales of the Learning Express using linear regression. The first of these models which used MO to predict spring alphabet knowledge, controlling for fall alphabet knowledge, age, race, gender, and baseline puzzle ability was significant, F(6,292) = 37.93, $p < .001$. However, MO was not a significant predictor of spring alphabet knowledge after entering the covariates in the model, t= -.06, p = .947. The next model which used MO to predict spring vocabulary, controlling for fall vocabulary, age, race, gender, and baseline puzzle ability was significant, F(6,292) = 50.08, $p < .001$. Again MO was not a significant predictor of

spring vocabulary after entering the covariates in the model, t= .059, p = .953 (see Table 3).

The next model used MO to predict spring math scores, controlling for fall math scores, age, race, gender, and baseline puzzle ability and was significant, F(6,292) = 69.23, $p < .001$. However, MO was not a significant predictor of spring math scores after entering the covariates in the model, t= 1.05, p = .296. The final model which used MO to predict spring listening comprehension, controlling for fall listening comprehension, age, race, gender, and baseline puzzle ability was significant, F(6,292) = 13.78, $p < .001$. But again MO was not a significant predictor of spring listening comprehension after entering the covariates in the model, t= .64, p = .526 (see Table 3) (For correlations between MO and all readiness outcomes see Table 5).

CHAPTER 4: DISCUSSION

In the present study the Mastery Motivation Puzzle Task (MMPT) was used to categorize low-income preschool children enrolled in a large urban Head Start program into two motivational categories (Smiley & Dweck, 1994). Pilot data were initially collected to ensure that the puzzles used in this task were equal in difficulty level prior to assigning them to the solvable/unsolvable conditions. Seventy-seven percent of children (N=259) were classified as MMO while only 23% of children (N=75) were classified as PMO.

The current study is also the first to collect the MMPT at multiple time points in order to assess the stability of the measure. Ninety percent of children who utilized the MMO during their first MMPT assessment utilized the same orientation during their second assessment. Conversely, only 50% of children who utilized the PMO during their first MMPT assessment utilized the same orientation during their second. These results suggest that the MMO may be more stable than the PMO. This finding could have important implications for intervention work; if the less adaptive PMO is less stable and more likely to change, then it may be more sensitive to intervention. Additionally, if the MMO is more stable, then children may be more likely to continue utilizing that more adaptive orientation post-intervention.

Prior studies utilizing the MMPT have reported children endorsing the MMO approximately 50% of the time (Brown, 2009; Day & Burns, 2011). However, in the current study which has a sample size three times larger than any study to date using this measure, the MMO was endorsed by 77% of children. Studies administering the MMPT have used different puzzles (with different fictional characters and different amounts of

pieces) and this study is the only one that reported pilot work to ensure the difficulty level of puzzles were comparable. Due to these minor procedural variations, results require replication in other samples of low-income preschoolers, but they also suggest a story of hope and promise. Considering the many benefits of adaptive motivational styles for children who are being raised in high-risk, low-income environments, it is encouraging to see children choose to accept challenging tasks and persist in the face of setbacks at such a high rate.

All verbalizations children made during the MMPT were coded and results from the current study replicated a previous finding that MMO children make fewer negative evaluations of their ability during challenging tasks (Day & Burns, 2011). Direct assessments of early science, language, and math, were collected in the fall and again in the spring, and a teacher rating scale of approaches to learning was collected in the winter. Controlling for fall scores MO did not predict early science, language, or math skills in the spring. Similarly MO did not predict teacher ratings of children's approaches to learning. These null findings could be due to a lack of sensitivity in the measurement properties of the MMPT which yields a dichotomous outcome.

The vast majority of cognitive constructs exists on a continuum and mastery motivation is not a likely exception to this rule. Generally certain children are highly motivated to take on challenges and persist in the face of setbacks, while others waver back and forth depending on the circumstances, and some children shy away from challenges all together. By dividing children into only two groups, critical variation between children is being lost and this lack of sensitivity could be the reason that mastery motivation is not predicting gains in school readiness. Future research should explore

more sensitive versions of the MPPT that yield continuous outcomes and capture more variability between children.

Limitations and Future Directions

This study advances the literature by conducting the largest and most detailed examination, of the only direct assessment of MO for preschoolers, to date. However, this study also has several limitations. The sample was predominantly African American (71%) and Latino (27%), and all children attended Head Start, indicating children come from low-income families. While research should target these at-risk populations, this sample is not nationally representative and results cannot be generalized to the rest of the population. Future research should replicate this study in samples of children from different ethnic backgrounds and family income levels.

During the MMPT children fail on three consecutive puzzles and succeed on a fourth, they are then displayed all four puzzles and expected to reflect on their success with those puzzles and decide which they would like to attempt again. Another limitation that must be acknowledged is the assumption that children were selecting the puzzle they wanted to attempt again based on their previous experiences with the puzzles and not random chance. It may be the cognitive demand of this task is too high, and expecting these children to hold their experiences with four different puzzles in their working memory and make a decision based on those experiences, is not developmentally appropriate. Given three of the four puzzles children select result in MMO classification if children were selecting at random, 75% of children would be classified as MMO. This number is strikingly similar to the actual percentage of MMO children in this study, 77%.

If children are truly selecting at random that would indicate that the MMPT is not developmentally appropriate for the children in this sample and this also may explain the complete lack of concurrent validity (in relation to approaches to learning), and predictive validity (in relation to academic school readiness outcomes), shown by the MMPT in this study. Future research should focus on development of direct assessments of MO that reduce the cognitive demand to ensure they are developmentally appropriate for children of all ethnic backgrounds and family income levels.

Another potential limitation is the uni-dimensional nature of the MMPT, which employs only puzzles when assessing MO. Children's previous experience with puzzles may affect their level of comfort in attempting a difficult task, and although baseline puzzle ability was controlled for in all analyses, children's choices when dealing with puzzles may not reflect their choices with different tasks. For example, if a child who is typically reluctant to attempt a challenging task has vast experience with puzzles, he or she may be willing to attempt a challenging puzzle due to confidence drawn from prior experience; this would not reflect their typical response, and thus would not be a valid indicator of their overall MO. Future direct assessments of MO should employ multiple tasks to reduce the risk that previous experience with a single task is limiting the generalizability of children's MO classifications. Despite these limitations the current study is a valuable resource for investigators aiming to develop novel measures of MO that are sensitive, reliable, and developmentally appropriate for preschool children from low-income families.

CHAPTER 5: CONCLUSION

Previous research has demonstrated the need for domain-general skills, which are teachable, malleable, and can contribute, to the general learning of children from low-income families (Li-Grining, 2007; McClelland et al., 2007). MO is one such skill that has been shown to be malleable in the context of intervention for older children (Blackwell, Trzesniewski & Dweck, 2007). The current study examined the distribution of MMO vs. PMO children from low-income families and offers exciting evidence that the majority of these children are choosing to embrace challenging tasks. This study was also the first to administer the MMPT at multiple time points to assess stability and results suggest that the MMO may be more stable over time than the PMO.

The relationships between MO, approaches to learning, and academic school readiness were also examined. Despite the null findings, results further our understanding of the only early childhood direct assessment of MO, and lend guidance towards the next steps for further research of MO among preschoolers from low-income families. In order to continue research on this powerful domain-general construct among a vulnerable population; research must aim to develop improved measures of MO so it can reliably and sensitively captured in young, ethnically diverse, children from low-income families. Results of this line of research have the potential to offer support for the development and implementation of MO interventions, aimed at fostering adaptive motivational strategies in at-risk preschool aged children.

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Table 1. *Percentage of Children who Initially Endorsed MMO or PMO that Stayed with their Original MO or Switched (N=113). Cohen's Kappa (K= .392, p < .001) Suggests Fair Stability.*

Initial MMPT		Secondary MMPT	
	n	MMO	PMO
MMO	58	90%(n=52)	10%(n=6)
PMO	55	51%(n=28)	49%(n=27)

Table 2. *Summary of Regression Analyses for Motivation Orientation (MO) Predicting Approaches to Learning (ATL) and Negative Ability Evaluation (NAE) Verbalizations, Controlling for Age, Race, Gender, and Baseline Puzzle Ability (BP Ability).*

	Outcome Variable	
	ATL	NAE
Variable	*B (SE)*	*B (SE)*
MO	-.05 (.98)	-.45** (.54)
Age	.40** (.06)	
Race	-.15** (.88)	
Gender	.14** (.82)	
BP Ability	-.07 (.01)	
n	298	38

*$p < .05$. **$p < .01$.

Table 3. *Summary of Regression Analyses for Motivation Orientation (MO) Predicting Spring Science, Math, Alphabet Knowledge, Vocabulary, and Listening Comprehension Scores, Controlling for Fall Scores, Age, Race, Gender, and Baseline Puzzle Ability (BP Ability).*

	Spring School Readiness Outcomes				
	Science	Math	Alphabet	Vocabulary	Listening
Variable	*B (SE)*	*B (SE)*	*B (SE)*	*B (SE)*	*B (SE)*
MO	-.08 (.10)	.04 (3.81)	-.003 (5.21)	.002 (4.60)	.03 (4.80)
Fall Score	.55** (.05)	.70**	.57** (.05)	.63** (.04)	.34** (.05)
Age	.12* (.01)	(.04)	.16** (.36)	.15** (.32)	.19** (.33)
Race	-.07 (.09)	.06 (.28)	.04 (4.60)	.05 (4.24)	.02 (4.25)
Gender	.11* (.08)	.02 (3.38)	.09* (4.26)	-.05 (3.76)	.12* (3.91)
		-.02 (3.11)			
BP Ability	-.06 (.01)	-.07 (.01)	.03 (.01)	.05 (.01)	-.01 (.01)
n	306	304	304	304	304

*$p < .05$. **$p < .01$.

Table 4. *Task Verbalization Categorization Definition and Examples*

Category	Definition	Example
Task-Relevant Facilitative	Statements related to the task at hand that represent attempts by the child to focus his or her cognitive resources on the task, to plan or organize task-related activities, and to correct, cope, or motivate the child while working	
Strategy	Statements reflecting children's plans and hypotheses about pieces and their potential locations	"I make my colors match right here."
Self-motivating	Statements meant to encourage or praise their work on the task	"I can do it!"
Task-appropriate solution	Statements related to searches for appropriate pieces or (not) fitting a puzzle piece	"This piece goes right here."
Task-appropriate difficulty	Statements indicating that the child is having difficulty completing the puzzle or fitting a piece	"Oh, this piece is backwards."
Challenge	Statements indicating the child wants to continue working on the challenging task, is enjoying the task, or wants to attempt an additional task	"Can we come back to this puzzle? I'm not done."
Task-Relevant Non-facilitative	Statements that are related to the task, but "serve to delay or stop accompanying task-related behavior"	
Performance concern	Statements concerning adequate performance on	"I bet that puzzle is going to be too hard."

	task	
Negative ability evaluation	Statements that the child thinks they lack ability and skills needed to complete task	"I'm not smart at puzzles."
Disengaged	Statements that the child does not want to continue working on the task or wants to work on some other task	"I don't want to do this puzzle anymore."
Help	Statements in which the child tells the experimenter to help them or asks the experimenter for help	"Help me do this."
Task-Irrelevant	Statements that do not relate to the challenging puzzle task	
Off-task	Statements about the immediate environment, free associations about the puzzles, or some comments about the child's personal life	"What's that noise?"
Ambiguous	Incomplete or unintelligible utterances	Ambiguous
Ambiguous/unintelligible	Sentence fragments that did not provide enough information to assign a code or were otherwise unintelligible	Humming sounds

Table 5. *Bivariate Correlations between Motivation Orientation (MO), Approaches to Learning (ATL), and All Spring Readiness Outcomes.*

	Correlations					
	ATL	Science	Math	Alphabet	Vocabulary	Listening Comp
MO	.010	-.040	.056	.046	-.015	.033
ATL		.350**	.369**	.308**	.210**	.261**
Science			.499**	.404**	.535**	.481**
Math				.656**	.609**	.427**
Alphabet					.463**	.433**
Vocabulary						.504**
n	298	306	304	304	304	304

*$p < .05$. **$p < .01$. MO (n=334)

Figure 1. Puzzles used for MMPT only middle 8 pieces were not glued down.

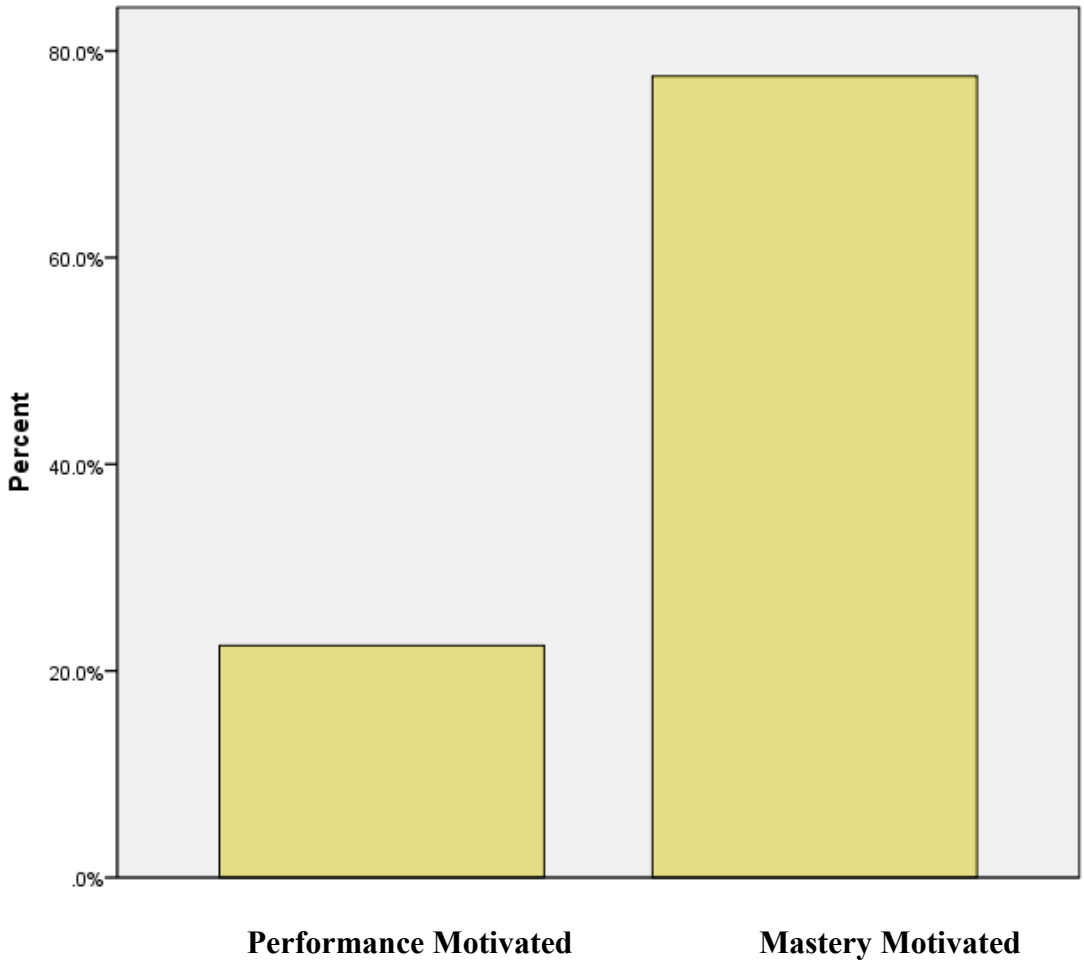

Figure 2. Percentage of children endorsing a mastery motivated orientation vs. performance motivated orientation.