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Patterns of Mastery Task Behavior in Early School-Age Children in the United States

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Abstract

This investigation employed a person-oriented approach to explore whether distinct mastery motivation groups are identifiable based on patterns of children's mastery task behaviors (MTBs) in 64 typically developing students ages 7 and 10 years. Relationships among MTBs, mastery motivation ratings, and intrinsic motivation ratings were analyzed using secondary data. Measures included mastery tasks, mother and teacher ratings of the child on the Dimensions of Mastery Questionnaire (DMQ), and two intrinsic motivation subscales (preferences for challenge and independent mastery) rated by teachers. Goals included investigating (a) whether distinct group-case profiles of MTBs would emerge from the data, and (b) to what extent these profiles can be predicted by teacher and mother ratings. A four-cluster solution resulted in the best, interpretable model fit. The four profiles were: 1) Consistently high MTBs, 2) Moderately high MTBs, 3) Inconsistent MTBs, and 4) Lowest MTBs. Mother-rated DMQ object persistence scores effectively predicted children's categorization into mastery task behavior Profiles 1 and 2 (high and moderate MTBs) with Profile 4 as the comparison. Teachers' ratings of independent mastery predicted categorization into Profile 2 over Profile 4. Findings have implications for classroom intervention using small group activities based on profile patterns to support mastery motivation.

Keywords: motivation, persistence, elementary school students, mastery tasks, intrinsic motivation, person-oriented approach

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Introduction

The purpose of this study was to employ a person-oriented approach to exploring whether distinct mastery motivation groups or profiles may be identified based on children's observed patterns of mastery task behaviors assessed in a home setting. This study represents a secondary analysis using data from an earlier study. Measures used in this secondary analysis included individually administered structured behavioral mastery tasks, mother and teacher ratings using the Dimensions of Mastery Questionnaire (DMQ-17; Morgan, 1997), and two subscales from the teacher-rated Harter's Intrinsic versus Extrinsic Motivation In the Classroom Scales (Harter Intrinsic Motivation; Harter, 1981). The current analysis was intended to identify profiles of mastery task behaviors and whether variation in profiles may be predicted by mother and teacher DMQ ratings and by teacher ratings of children's intrinsic motivation observed in the classroom.

Parent and Teacher Perceptions and Children's Mastery Task Behavior

Mastery motivation is an inherent force that stimulates a person to attempt to master a skill or task that is at least moderately challenging for them (Morgan, Harmon, & Maslin-Cole, 1990). Parent and teacher DMQ ratings were validated using observed measures of children's mastery task behavior (e.g., Morgan, Busch-Rossnagel, Barrett, & Wang, 2009); however, it is less clear how these ratings may be related to specific patterns of children's mastery task behaviors. Correlations between parents and teachers on the scales of the DMQ (median r = .42) tended to be stronger than those of either parent or teacher with child self-reports (median r = .18). All these raters particularly agreed on the child's gross motor persistence, social mastery/persistence with other children and mastery pleasure. In a previous study, Morgan and Bartholomew (1998), found non-statistically significant associations between mastery task behavior and the summary maternal DMQ ratings. Small correlations, for instance, were found between maternal DMQ total persistence with behavioral task persistence scores (r = .23) and with choice for challenge (r = .15). Parent and Teacher DMQ total mastery motivation ratings (i.e., total persistence plus mastery pleasure) were not correlated with the children's mastery task behaviors (e.g., persistence and choice for challenge).

While the results were unexpected, there were some concerns over ceiling effects on the mastery tasks that may have affected the results. It thus raised the question about whether there were alternative ways of examining children's mastery task behavior scores in conjunction with the DMQ. The current analysis allows for an investigation of mastery task behavior in a more child-centered context, meaning how children performed on the variety of task measures together could be examined in concert rather than individually as variables (e.g., scores of mastery task persistence). In other words, instead of correlating DMQ scores with, for example, mastery task persistence alone, this study examined mother- and teacher-rated scores in association with an array children's mastery task behaviors combined into meaningful patterns.

A Person-Oriented Approach to Examining Mastery Task Behaviors

Studies have indicated that children's mastery motivation may vary across age (e.g., Barrett & Morgan, 1995), contexts (e.g., culture, socio-economic status, parenting practices; e.g., Józsa, Wang, Barrett, & Morgan, 2014), and domains (e.g., gross motor/sports, cognitive/academic; Józsa et al., 2014). Individual differences in mastery motivation are also acknowledged as important because of their link to later learning and achievement (Barrett & Morgan, 1995; Turner & Johnson, 2003). Individual differences, however, may be treated as error in variable-oriented statistical analyses (Raufelder, Jagenow, Hoferichter, & Drury, 2013).

A majority of mastery motivation studies use a variable-oriented approach. This means that associations among constructs have been examined in the context of means (or other central tendencies) of a variable, looking at variation in how certain variables impact outcomes. What has not been investigated is how these strengths or challenge aspects within this drive interact within an individual to tell a more complex story. They also provide little information with respect to how groups of individuals may exhibit similar patterns or attributes.

Using a person-oriented approach differs from a variable-oriented approach in that it allows for the interplay of individual children's experiences (in this case with regard to their mastery task behaviors). It can also provide an understanding of the relative proportions of children experiencing a given data-identified pattern of behaviors (see Bergman & Magnusson, 1997 and Raufelder et al., 2013). This approach can be helpful for answering questions around group differences in patterns of mastery motivation. Person-oriented approaches analyze the individuals' patterns of experience that emerge from the combined variables of interest. Individuals who share similar patterns of experience or attributes naturally form subgroups that differ from each other (Bergman & Magnusson, 1997).

Employing a person-oriented approach may provide a deeper understanding of how mastery motivation is differentially experienced by children. This may yield a potentially greater opportunity to examine how observed mastery task behaviors may manifest in meaningful and distinct mastery behavior profiles. Testing a theoretical model of mastery motivation, Turner & Johnson (2003) discussed how motivational patterns may develop early as a function of family variables, but the complexity and prevalence of those motivational patterns are not well-defined. In terms of practical implications, Hauser-Cram (1998) discussed how children's motivation can vary in different contexts and that it presents an opportunity to explore how teachers can encourage display of mastery motivation in the classroom or other educational settings. The revelation of patterns of mastery task behaviors may provide clearer guidance, for example, in how teachers provide individual- and group-level instructional support.

As an educational program evaluation tool, the person-oriented approach has advantages over a variable-oriented approach which results in more global estimates of intervention effects. A variable-oriented study may potentially mask efficacy of an intervention even when there is a rigorous control or comparison group (Lapka, Wagner, Schober, Gradinger, & Spiel, 2011). The person-oriented approach allows for evaluation of program results with deeper consideration to differences (heterogeneity) *within* the intervention group. This information may help teachers understand intervention outcomes for different groups of children in a variety of educational settings. Then, they may learn how to more appropriately individualize and refine their efforts to support children's development in the future. More effective interventions intended to boost children's approaches to learning (such as mastery motivation behaviors) can be created with children's group differences in mind.

Mastery Task Behavior Profiles and Classroom Readiness-to-Learn

Mastery motivation is an established predictor of kindergarten and later school success (Gilmore, Cuskelly, & Purdie, 2003; Józsa & Molnár, 2013; Turner & Johnson, 2003). Mokrova, O'Brien, Calkins, Leerkes, and Marcovitch (2013), for example, found kindergarten effects on math and literacy predicted by their early persistence. No doubt mastery motivation is a precursor of achievement motivation (Dichter-Blancher, Knauf-Jensen, & Busch-Rossnagel, 1996; Morgan & Yang, 1995). Certainly, mastery motivation is closely related to other readiness-to-learn indicators, such as executive function, intrinsic motivation, and other cognitive abilities. This, then, warrants a closer look at teacher perceptions and support of children's learning-related behaviors. Lee (2014), for instance, found that children's early mastery motivation was linked to memory and problem solving executive functions in the first grade. Some evidence exists related to the persistence of these effects into later elementary grades. For example, Józsa and Molnár (2013) found links between mastery motivation and both grade-point average (GPA) and achievement in specific subjects for third and sixth grade students.

It has become increasingly clear that many factors contribute to children's ability to learn and progress in school aside from pure cognitive capacity. Specifically improving understanding of the links among assessments of mastery motivation, children's demonstrations of mastery behaviors, and ratings of their school behaviors may lead to the development of motivation-enhancing supports. Such supports can be helpful in early childhood settings as a part of school readiness interventions preparing children for elementary school. Keilty and Freund (2004) made specific recommendations regarding interventions with mastery motivation to enhance the learning process. These included adjusting the difficulty level of tasks to increase goal orientation and modeling goal achievement. Ricks (2012) also explored teacher instructional practices linked to the development of mastery motivation in relation to mathematics achievement in kindergarten and beyond. She found that teachers' student-centered approaches (in which early childhood students were encouraged to be involved in their own learning

processes) were, overall, more effective than teacher-centered practices in fostering mastery motivation.

Effective instructional strategies to support growth in mastery motivation, however, may not be one-size-fits-all (Lapka et al., 2011). Children may need more individualized support through one-on-one or small group activities in the classroom. The purpose of the person-oriented approach is not to identify that every child has his/her own type; instead the aim is to learn how children are similar or how they differ from others and in what respects (Bergman, Magnusson, & El-Khouri, 2003). Understanding whether groups of children within a classroom have similar needs related to the development of mastery motivation would help direct teachers' intentionality in classroom practice. They could more appropriately design individual, small group, or full classroom interventions.

The original Morgan and Bartholomew (1998) study used the teachers' rating of children's general competence from the DMQ and intrinsic motivation (Harter, 1981) as criteria of readiness-to-learn (i.e., potential for school success). DMQ and mastery task behaviors were examined as predictors. The current analyses expand on those findings to better understand the complexity of mastery motivation development using a new analytic approach. In addition, it is possible these findings may help identify improved measurement strategies to increase relevance to the skills children need in school (e.g., Józsa, Barrett, Józsa, Kis, & Morgan, 2017).

The goals of this research were to investigate (a) whether distinct group-case profiles of mastery task behavior would emerge from the mastery task data, and (b) to what extent mastery task behavior profiles can be predicted by mother- and teacher-rated DMQ persistence subscales, and by teacher ratings of school classroom behaviors demonstrating intrinsic motivation.

Method

Participants

The 64 participants were mostly middle class and Caucasian, living in a middle-sized city in the Western United States. The sample was comprised of 31 boys and 33 girls with typical development who were approximately seven and 10 years old. Three out of the 64 children were racial minorities. Five were from working class families, 39 were middle class, and 20 were upper middle class.

Measures

Mastery Tasks

Four sets of individualized mastery tasks were developed for the original study. Scores were based on observations of the child's behaviors while attempting to solve the tasks within the context of the home setting. The four types or sets of tasks were: (a) spatial

matching (several puzzles of increasing complexity), (b) goal formation (Tower of Hanoi; difficulty increased by the number of required moves of the blocks), (c) fine motor (e.g., pinball; several small toys requiring hand rotation of the object to guide ball through a maze), and (d) gross motor (ring toss; difficulty level increased by lengthening distance required to throw). Each set had five levels of difficulty, varying from an easy level that all 7-year olds could solve in 1 minute to a very hard level that no 10-year old could solve completely in 5 minutes.

Each child was first given a task from each of the four sets that was relatively easy for them. This allowed us to estimate their skill/competence and to provide them with a sense of accomplishment. Then, the child was given a level of the task intended to be moderately challenging but somewhat too hard for him or her to complete *fully* in 5 minutes. The children were told that they could stop working on the task whenever they wanted. This challenging task was judged to be appropriately challenging if the child could solve part of it, but not all of it, in 5 minutes. If the child successfully completed all of a challenging task in less than 5 minutes, he/she was also given the next harder task. A behavioral measure of persistence was based on the duration of the children's *persistence at each moderately challenging task*, plus an adjustment of up to 2 minutes if they finished the challenging task in five minutes or less. Reliability correlations for two observers scoring 10 children was 1.00 (Spearman rho) for the persistence measures (mean scores range from 1 to 7).

After 5 minutes, the tester asked if the child would now like an easier task, a harder task, or continue with the same task. The child was asked this to obtain a measure of *choice for challenge*. Reliability for choice for challenge was 1.00 (mean scores range from 1 to 3).

In addition to the persistence and choice for challenge scores coded during mastery tasks, an overall ratings of negative reactions was made by the tester after each home visit on a 5-point Likert-type scale (i.e., 1 *very low* to 5 *very high*). The reliability correlation for the negative reaction to challenge rating on 10 children was .80.

Dimensions of Mastery Questionnaire (DMQ)

The DMQ (DMQ-17; Morgan, 1997) has been used extensively for school-age children as well as infants and preschool children (Józsa & Molnár, 2013; Morgan, Wang, Liao, & Xu, 2013). Mothers and teachers rated the children on the DMQ-17 school-age version (Morgan, 1997; Morgan et al., 2009, 2013). The survey contain 45 items and seven scales. The items are rated on a 1 to 5 point scale (i.e., 1 is *not at all typical* to 5 *very typical*). The DMQ has four persistence/mastery motivation scales. Two of them, cognitive persistence and motor persistence, were used in this study. In addition, the DMQ provided measures of mastery pleasure, negative reaction to challenge, and general competence.

Internal consistency of these scales was very good for mothers and teachers of these elementary school children; alphas ranged from .76 to .92, with a median of .88. In other studies, alphas have been generally good for parent and teacher/caregiver ratings of infants and preschoolers (Morgan et al., 2013) and also for teen self-ratings (Józsa & Molnár, 2013).

Factor analyses for large, more diverse (in geography, age, and ethnicity) groups of parents and of children/teens support the grouping of items into the four persistence and the mastery pleasure domains (Józsa et al., 2014; Morgan et al., 2013). Factor analysis of parent responses was clean and consistent with the 5-factor model. However, factor analysis for self-ratings by children themselves is somewhat less clear, but still provides considerable support for the factorial validity of these five domains.

Scale scores for the current sample were moderately related. In general, the five persistence and the pleasure scale scores were less highly correlated for the mother ratings (median r = .20) than for teacher ratings (median r = .37). The object persistence scale was highly correlated with competence, for teachers (r = .77) and mothers (r =.61) who seem to view cognitive/object persistence and general competence as highly related.

Harter's Intrinsic Versus Extrinsic Motivation in the Classroom Scale

Teachers completed child ratings using two of the subscales from Harter's (1981) Intrinsic versus Extrinsic Motivation in the Classroom measure (Harter Intrinsic Motivation). The two scales were *preference for challenge* (examining the extent to which select hard or difficult tasks compared with easy tasks) and *independent mastery* (assessing how children may prefer to work on their own or to seek support to accomplish tasks). These were rated on a four-point scale where 1 is low and 4 is high on the subscale items. An overall mean score for each of the two scales is computed to derive the subscale totals. Two validity samples showed the two subscales as distinct constructs, yet moderately correlated (r = .48 and .61) with internal consistency reported at r = .78 to .84 for preference for challenge and r = .68 to .82 for the independent mastery subscale (Harter, 1981).

Procedures

The DMQ, four mastery tasks (cognitive/spatial puzzles, fine motor tasks, cognitive/goal formation activities, and gross motor tasks), and other surveys were administered in the children's homes (see Bartholomew & Morgan, 1997). Teachers were sent the Harter Intrinsic Motivation scale and asked to return it by postal mail to the researcher.

Data Analysis

This study represents a secondary analysis using data from an earlier study (Morgan & Bartholomew, 1998). Four mastery task behavior variables were used in this analysis.

They were cognitive persistence (mean across the two cognitive tasks, possible scores ranged from 1 to 7), motor persistence (mean across the two motor tasks, possible scores range from 1 to 7), choice for challenge (mean across all tasks, possible score ranges from 1 to 3) and negative reaction to failure (Likert-type rating, possible scores range from 1 to 5). Means for negative reaction to failure were reversed to indicate a lack of negative reaction, this way they could be interpreted in the same way (high=good) as the other variables. The cognitive persistence score was calculated as the average of the persistence score of the spatial matching task and goal formation task (possible mean score range from 1 to 7). Motor persistence score was the average of the persistence score of the fine motor and gross motor task (possible scores ranged from 1 to 7).

The DMQ variables used in this study were mother-rated and teacher-rated scores on the object persistence and the gross motor persistence subscales (possible means ranged from 1 to 5 for each scale), intended to align with the two persistence mastery task behaviors above. The two Harter Intrinsic Motivation variables were preference for challenge and independent mastery (possible means ranged from 1 to 4 for each scale). Please see Table 1 for means and standard deviations. Correlations among the four mastery task behaviors, the DMQ, and the Harter measures are provided in Table 2.

Another experimenter-rated mastery task behavior variable linked to the affect component of mastery motivation, "pleasure at hard tasks", was omitted from the analyses. Because of the lack of variability in children's pleasure response to difficult tasks, it was determined that it would not be able to support distinguishing cases into groups. Instead, the affect-related mastery motivation aspect was captured using the reversed negative reaction to failure variable.

A person-oriented analytic approach was used to identify profiles of mastery task behavior based on data from individually administered mastery tasks. Person-oriented approaches empirically identify discrete groups or profiles (among children in this case) that share similar patterns based on correlation among multiple indicators (Hagenaars & McCutcheon, 2002). For this secondary analytic study, two-step cluster analysis was used to identify interpretable groups based on children's mastery task behaviors. Cluster analysis is a form of classification that uses the data to identify two or more profiles based on their within group similarities and their between group differences (Kaufman & Rousseeuw, 1990).

Identifying profiles is an exploratory process to identify the most accurate division of the cases into clusters and, for this study, cluster quality was gauged on (1) conceptual interpretability of the clusters, (2) comparison of cluster quality across models, and (3) assessment of cluster quality using the silhouette coefficient which represents a combination of cluster cohesion (how closely related are cases within clusters) and separation (how distinct cases are from cases in other clusters). The coefficients range

from -1 to 1 where values at .5 or higher indicate good cluster quality, while those below .2 indicate a lack of cluster structure (Kaufman & Rousseeuw, 1990).

The hypothesis was that a three-cluster solution would best identify groups based on their mastery task behavior (MTB) data, indicating roughly corresponding to groups labeled as "high MTB", "inconsistent MTB", and "low MTB". Two- and four-profile solutions were also planned as comparisons for assessing cluster quality.

Multinomial logistic regression was used to predict cluster classification from the mother- and teacher-rated mastery motivation total scores derived from the DMQ, as well as from the teacher intrinsic motivation scores. This is a flexible and robust method used to predict categorical dependent variables (e.g., cluster membership) when there are more than two levels (Pohar, Blas, & Turk, 2004). The technique uses a maximum likelihood estimation instead of the traditional regression least squares estimation. This analysis examined whether mother or teacher ratings were predictive of the likelihood of a child being in a certain cluster versus another (reference group).

In this case, the analysis yields odds-ratios to reveal the likelihood of mastery task behavior group membership as a function of mother- or teacher-rated mastery motivation variables. An odds-ratio of 1, for example, indicates that scores do not predict membership in a particular mastery task behavior group, while greater than 1 indicates increased likelihood compared with reference group, and less than 1 means the predictor is associated with lower odds of being in a specified group other than the reference group. No age or gender covariates were used in the predictive models since few significant gender or age differences were found in the prior study (Morgan & Bartholomew, 1998).

Results

Preliminary Analysis

Total group descriptive statistics were computed for each of the MTB variables to be clustered and for the other analytic variables used in the logistic regressions (Table 1).

Table 1. Descriptive statistics of Mastery Task Behaviors (MTB), DMQ Mastery Motivation Ratings, and Teacher-rated Preference for Challenge and Independent Mastery (n=64)

Measures	*M*	*SD*	Range
MTB - cognitive persistence	5.77	1.10	1.0-7.0
MTB - motor persistence	5.67	1.24	1.5-7.0
MTB - choice for challenge	1.85	0.48	1.0-3.0
MTB - negative reaction to failure (reversed)	3.91	0.90	2.0-5.0
DMQ - mother-rated object persistence	3.66	0.66	1.9-4.8
DMQ - mother-rated gross motor persistence	3.78	0.83	2.3-5.0
DMQ - teacher-rated object persistence	3.71	0.73	2.3-4.9
DMQ - teacher-rated gross motor persistence	3.52	0.68	1.3-5.0
Harter - preference for challenge	2.74	0.70	1.0-4.0
Harter - independent mastery	2.75	0.80	1.0-4.0

Correlations among the study measures are presented in Table 2. Low to moderate correlations were found among the mastery task behavior scores, except for no relation between choice for challenge and negative reaction to failure. Among the MTBs, children's cognitive persistence was most highly related to their motor persistence. Mother and teacher-rated cognitive persistence and intrinsic motivation were significantly associated with children's cognitive persistence on tasks. Mother and teacher-rated motor persistence and intrinsic motivation were not significantly related to children's motor persistence on tasks. Mother-rated object persistence on the DMQ was significantly associated with all other mother- and teacher-rated measures.

Table 2. Pearson Correlations among Mastery Task Behaviors (MTB), DMQ Mastery Motivation Ratings, and Teacher-rated Preference for Challenge and Independent Mastery (n=64)

Measures	1	2	3	4	5	6	7	8	9
MTB - cognitive persistence	-								
MTB - motor persistence	.48**	-							
MTB - choice for challenge	.21	.29*	-						
MTB - negative reaction to failure[a]	.38**	.28*	.04	-					
DMQ - mother-rated object persistence	.42**	.14	.15	.31*	-				
DMQ - mother-rated gross motor persistence	.21	.24	.27*	.10	.37**	-			
DMQ - teacher-rated object persistence	.28*	-.04	.12	.27	.57**	-.03	-		
DMQ – teacher-rated gross motor persistence	.23	-.05	.25	.15	.34*	.30*	.41**	-	
Harter - preference for challenge	.33*	.04	.04	.07	.42**	-.12	.74**	.25	-
Harter - independent mastery	.30*	.19	.24	.08	.28*	-.18	.54**	.18	.66**

*[a] reversed; *p<.05, **p<.01*

Identification and Description of MTB Profiles

A key stage in the analysis was to identify any discernable group profiles within the full data set. The two-step clustering process involved the use of standardized scores from each of the MTB-related variables (cognitive persistence, motor persistence, choice for challenge, and negative reaction to failure). Standardized scores (Z-scores) were calculated by subtracting the group mean from each of the individual scores and dividing the result by the standard deviation. The scaling of variables may influence their contribution to the final solution, thus all measures were standardized to the same metric (M = 0, SD = 1) as shown in the lower half of Table 3. This process also allowed for more interpretable profiles, and they could be graphed together to look at high-low patterns for each group.

While two-cluster and three-cluster solutions were conceptually interpretable, they were of "fair" quality (.4) with regard to SPSS's measure of cluster quality (i.e., silhouette measure of cohesion and separation). Profile means and standard deviations (unstandardized scale and standardized) are provided in Table 3.

Table 3. Means and Standardized Means (standard deviations) for Variables Representing the Four-cluster Solution

Mastery task behaviors (MTBs)	Profile 1 Consistently high MTBs	Profile 2 Moderately high MTBs	Profile 3 Inconsistent MTBs	Profile 4 Lowest MTBs
Cognitive persistence	6.54 (0.38)	6.10 (0.81)	5.38 (0.58)	4.50 (1.27)
Motor persistence	6.62 (0.36)	6.05 (0.78)	4.75 (1.17)	4.42 (1.46)
Choice for challenge	2.06 (0.36)	2.00 (0.30)	1.19 (0.18)	1.71 (0.64)
Negative reaction to failure[a]	5.00 (0.00)	3.73 (0.45)	4.75 (0.46)	2.69 (0.48)
Cognitive persistence (Standardized)	.697 (0.35)	.297 (0.74)	-.363 (0.53)	-1.160 (1.16)
Motor persistence (Standardized)	.760 (0.29)	.304 (0.63)	-.743 (0.94)	-1.006 (1.17)
Choice for challenge (Standardized)	.432 (0.75)	.311 (0.63)	-1.391 (0.37)	-.293 (1.35)
Negative reaction to failure[a] (Standardized)	1.211 (0.00)	-.191 (0.50)	.933 (0.51)	-1.343 (0.53)

[a] Reversed

Contrary to the hypothesis, and compared with the other models, the four-cluster solution (see Figure 1) was the best fit resulting in "good" cluster quality (.5) and yielding interpretable groups as follows:

1. "Consistently high MTBs" profile with 13 (20.3%) of cases fit this profile, cases were approaching ceiling for cognitive and motor persistence, had high scores for selecting challenging tasks, and the cluster contained no cases with negative reactions to failure;
2. "Moderately high MTBs" profile with 30 (46.9%) of cases fitting this pattern. Yielded high cognitive and motor persistence, likely to select challenging tasks, but more likely than profile 1 to display a negative reaction to failure;

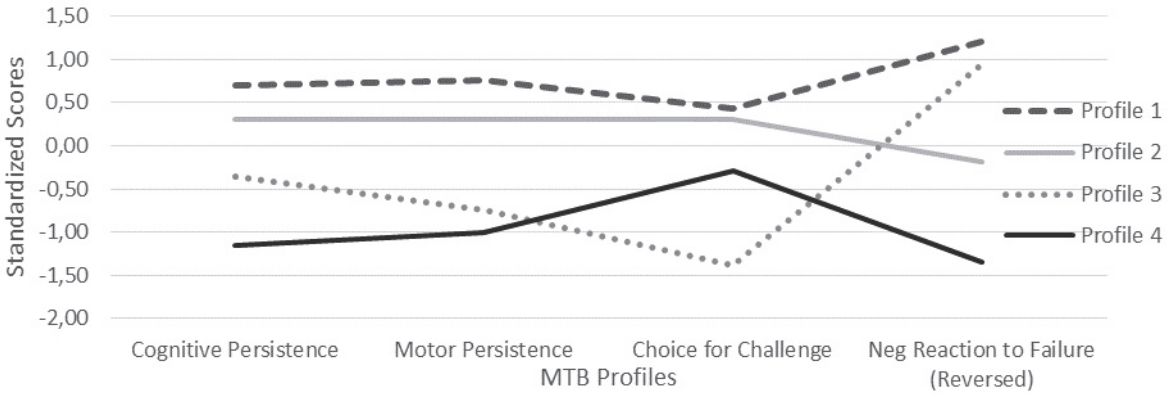

Figure 1. Mastery task behavior (MTBs) profiles for a - four-cluster solution using standardized scores. Note: Profile 1 = Consistently high MTBs Profile; Profile 2 = Moderately high MTBs Profile; Profile 3 = Inconsistent MTBs Profile; Profile 4 = Lowest MTBs Profile.

3. "Inconsistent MTBs" profile comprised of 8 (12.5%) of cases in which there was moderate cognitive persistence, slightly lower motor persistence, low choice for challenge, but little negative reaction to failure, and;
4. "Lowest MTBs" profile consisted of 13 (20.3%) of cases and describes as the cases with the lowest scores in cognitive and motor persistence, inconsistent choice for challenge, and the greatest likelihood of the profiles to show negative reaction to failure.

Predicting MTB Profiles from Mother and Teacher DMQ Ratings

Multinomial logistic regression was conducted to examine the extent to which mother and teacher ratings on the DMQ predicted the likelihood of being in a certain profile compared with a reference group (in these analyses Profile 4, the "lowest MTBs" profile was selected as the reference group). The analysis yields odds ratios describing how a one-point increase on the predictor variable impacts the likelihood of classification into a particular profile. Parameter estimates are provided in Table 4. Results using the predictors showed that children in Profile 1 (consistently high MTBs), were over six times more likely to be classified into Profile 1 than in Profile 4 for every one-point increase on the mother-rated DMQ object persistence subscale. Results also showed that cases in Profile 2 were 3.8 times more likely to be included in Profile 2 than 4 for every one-point increase on the object persistence scale. Mother-rated gross motor persistence and the two teacher-rated subscales did not predict profile classification.

In sum, mother-rated DMQ object persistence scores effectively predicted children's categorization into two of the mastery task behavior profiles. Neither mother-rated gross motor persistence nor teacher ratings predicted classification of child cases into MTB profiles.

Table 4. Multinomial Logistic Regression Estimates with Mother- and Teacher-rated DMQ Persistence Scores as Predictors and Using Profile 4 as the Reference Group

Variable	Profile 1			Profile 2			Profile 3		
	B	*SE*	O.R.	*B*	*SE*	O.R.	*B*	*SE*	O.R.
Intercept	-6.96	2.71	-	-3.85	1.94	-	-2.68	2.35	-
Mother object persistence	1.86*	.729	6.402	1.34*	.553	3.803	.653	.675	1.922
Intercept	-2.89	1.94	-	-1.38	1.56	-	-.453	1.99	-
Mother gross motor persistence	.772	.505	2.164	.600	.420	1.821	-.009	.558	.991
Intercept	-2.39	2.42	-	-.250	1.88	-	-2.40	2.75	-
Teacher object persistence	.647	.641	1.909	.323	.514	1.381	.515	.713	1.674
Intercept	-3.63	2.73	-	.534	2.03	-	-1.13	2.82	-
Teacher gross motor persistence	1.04	.745	2.818	.143	.585	1.153	.211	.805	1.234

**p<.05, **p<.01*

Predicting MTB Profiles with Harter's Intrinsic Versus Extrinsic Motivation In the Classroom Scale

The extent to which the two intrinsic motivation subscales (preference for challenge and independent mastery, r = .66**) predicted MTB profiles was also examined using multinomial logistic regression. The Harter preference for challenge subscale scores did not predict an increased likelihood of membership in Profiles 1, 2, or 3 compared with Profile 4. However, cases in Profile 2 were nearly 5 times as likely to be classified into Profile 2 compared with 4 for every one-point increase on the independent mastery subscale. Independent mastery did not predict increased likelihood of membership in Profile 1 or 3 relative to Profile 4 in these analyses.

Table 5. Multinomial Logistic Regression Estimates with Teacher-rated Preference for Challenge and Independent Mastery as Predictors and Profile 4 as the Reference Group

Variable	Profile 1			Profile 2			Profile 3		
	B	*SE*	O.R.	*B*	*SE*	O.R.	*B*	*SE*	O.R.
Intercept	-.638	1.397	-	-.635	1.235	-	-2.666	1.978	-
Preference for challenge	.282	.518	1.325	.587	.453	1.799	.757	.680	2.131
Intercept	-1.973	1.670	-	-3.308	1.641	-	-.606	1.760	-
Independent mastery	.815	.638	2.260	1.579*	.612	4.852	.000	.722	1.000

**p<.05, **p<.01*

In sum, children's likelihood of membership in Profile 2 (compared with Profile 4) was significantly predicted by teacher-rated scores on the independent mastery subscale. Children were 4.9 times more likely of being categorized into Profile 2 than in 4 for every one-point increase on the independent mastery subscale. Preference for challenge scores did not significantly predict increased likelihood of being in any profile compared with Profile 4. Also, no association was observed for Profile 3 with the more inconsistent pattern of MTBs with either Harter measure.

Discussion

The person-based approach yielded different information regarding the association of MTBs with the DMQ and Harter's intrinsic motivation scales than did the original study. Namely, for the whole sample, MTB variable *means* represented moderate levels of mastery motivation, while the cluster analysis used in this study yielded MTB *profiles* showed meaningful variations of patterns of MTB behaviors. These profiles indicated differences among and within groups of children in their pattern of MTBs. These classifications could imply how prepared they are to learn and contribute to their ultimate academic success.

Considering mother-rated object persistence and teacher-rated independent mastery as significant predictors of membership in certain profiles supports partial validity of this categorization. Perhaps more useful for teachers in understanding children's grouping into potential MTB profiles, may be the future inclusion of other child demographic variables or family data collected by schools or programs as predictors. For instance, understanding whether the families' socio-economic status or dual language learner status influences children's patterns of mastery task behaviors in the classroom may have practical, in-the-classroom salience.

In terms of the lack of significant predictors of Profile 3 classification relative to Profile 4, it is possible the subsample was too small. The issue could be that the low frequency of cases assigned to Profile 3 contributed to under-powering the analysis. The low frequency, in and of itself, is not grounds for eliminating the category of students, however. The composition of the group is valid in the same sense that the numbers of students in a classroom with other developmental challenges or delays may be low. Understanding who comprises these low-frequency groups may be especially important when considering appropriate interventions for students with high neEds.

Even with a fairly homogeneous sample such as this, (and MTB tasks prone to ceiling effects), discernable profiles emerged. Thus, in further studies with larger, more diverse samples, the findings could reveal more subgroups or subgroups with different patterns of observed mastery task behaviors. Clearly, the small sample size is a limitation of this study, particularly as the group sizes get smaller with classification. In addition, greater accuracy in profiling would be possible with larger samples. Then, one could use stronger analytic techniques such as latent class analysis, which is the preferred method for person-oriented analyses. Latent class analysis offers more precise statistics for assessing model fit than does cluster analysis.

Another way to strengthen categorization into mastery motivation profiles would be to increase the number and type of mastery motivation variables and data sources in the modeling. A greater variety of variables in the cluster or latent class modeling may improve the power and precision in identifying similarities and differences within groups of children. Another limitation of these findings was that these data were comprised of children 7 and 10 years old. It is unknown whether there may be developmental or age differences in the prediction of a child's mastery task behavior profile, and, while it was not a focus of this study given the small sample size, it would be helpful to address in future studies of this sort.

Given that distinct interpretable group profiles emerged, the findings from this study suggest that differential classroom educational strategies for enhancing mastery motivation may be helpful based on these groups. Considering that some groups of children may not already possess good or consistent foundational cross-domain skills in persistence and motivation, they may require different instructional or developmental supports compared with those who do. School instructional teams could craft more effective individualized or small group-based interventions for children to influence the cultivation of mastery motivation with the knowledge of their profile categorization or exhibited mastery task "style".

Conclusion

Using cluster analysis with children's mastery task behavior data, child cases were able to be grouped into four different interpretable profiles. These included consistently high MTBs, moderately high MTBs, inconsistent MTBs, and lowest MTBs groups. These profiles illustrate the interplay of children's mastery task behaviors using four aspects of this motivation (cognitive persistence, motor persistence, negative reaction to failure, and their choice for challenging tasks). The question of whether mother or teacher-rated measures of children mastery motivation could predict classification into the different profiles was explored. The discovery was that mother-rated cognitive persistence was an effective predictor of membership in Profile 1 ("consistently high MTBs") rather than into Profile 4 (i.e., the reference group, lowest MTBs profile). Children were also more likely to be classified into Profile 2 than into Profile 4. In addition, teacher ratings of

Harter's independent mastery subscale scores significantly predicted children's classification into Profile 2 rather than into Profile 4.

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