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MOTIVATION AND SOCIAL PROCESSES

Profiles of Intrinsic and Extrinsic Motivations in Elementary School: A Longitudinal Analysis

Jennifer Henderlong Corpus and Stephanie V. Wormington
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The authors used a person-centered, longitudinal approach to identify and evaluate naturally occurring combinations of intrinsic and extrinsic motivations among 490 third- through fifth-grade students. Cluster analysis revealed 3 groups, characterized by high levels of both motivations (*high quantity*): high intrinsic motivation but low extrinsic motivation (*primarily intrinsic*) and low intrinsic motivation but high extrinsic motivation (*primarily extrinsic*). Analyses of stability and change in cluster membership indicated that the primarily intrinsic cluster was most stable (76% stability) and the high-quantity cluster most precarious (45% stability) over the course of an academic year. Students in the primarily intrinsic cluster outperformed their peers in the other 2 clusters and showed the greatest increase in achievement over time.

Keywords *academic achievement, cluster analysis, elementary school, extrinsic motivation, intrinsic motivation*

IMAGINE TWO FOURTH-GRADE STUDENTS: Both are intellectually curious, derive pleasure from learning, and approach challenging work in the classroom, but one also aims to please authority figures and gain recognition for her accomplishments, whereas the other pays little attention to such external factors. These hypothetical students possess similarly high levels of *intrinsic motivation* (i.e., what is inherent to the self or task) but differ in their expression of *extrinsic motivation* (i.e., what originates from outside the self or task). The student with high intrinsic motivation but low extrinsic motivation fits well with the traditional conceptualization of the two motives as polar opposites (e.g., Deci, 1971; Harter, 1981; Kruglanski, Friedman, & Zeevi, 1971; see Lepper & Henderlong, 2000). The student with high levels of both motives, in contrast, fits with a view of intrinsic and extrinsic motivations as independent constructs that have the potential to operate simultaneously.

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This second perspective of simultaneously endorsed motives mirrors work in other prominent motivational frameworks, including expectancy-value theory (Trautwein et al., 2012; Wigfield, Tonks, & Klauda, 2009) and achievement goal theory (Barron & Harackiewicz, 2001; Linnenbrink, 2005), in which the optimal combination of goals remains a contested issue (Conley, 2012; for reviews, see Senko, Hulleman, & Harackiewicz, 2011; Zusho, Linnenbrink-Garcia, & Rogat, in press). The question of simultaneously endorsed motives and their repercussions, however, has been examined much less extensively within the intrinsic-extrinsic framework, and the limited work that exists focuses almost exclusively on samples of high school and college students (e.g., Ratelle, Guay, Vallerand, Larose, & Senecal, 2007; Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009; Wormington, Corpus, & Anderson, 2012; cf. Harter & Jackson, 1992; Hayenga & Corpus, 2010). The issue of simultaneously endorsed motives has rarely been examined with elementary-aged students within any motivational framework. A central question of the present study was whether the hypothetical students outlined earlier accurately represent those in everyday classroom environments at the elementary level. What combinations of intrinsic and extrinsic motivations naturally occur at this level of schooling? Do students retain the same combination of motives over a school year, or are there specific patterns of change that emerge? What are the consequences of such combinations for learning and achievement?

A holistic *person-centered approach* can aid in addressing such questions. Person-centered approaches focus on the constellation of and dynamic interplay among theoretically related variables at the level of the individual (Bergman & Trost, 2006; Laursen & Hoff, 2006; Magnusson, 2003). Such an approach can provide critical information concerning which combinations of motivation are prevalent, and how such combinations may change over time in distinct ways for different subgroups of students. It can also serve to complement existing variable-centered research in important ways. For example, Meece and Holt (1993) used person-centered techniques to reanalyze data on students' achievement goals that had originally been examined with traditional variable-centered methods (Meece, Blumenfeld, & Hoyle, 1988). Meece and Holt (1993) affirmed a number of findings but also uncovered relations that were masked in the original investigation, leading them to conclude that "... results based on linear methods of analysis may be incomplete and possibly misleading ..." and to call for additional research using cluster analysis as a person-centered technique (p. 589).

The Prevalence and Stability of Motivational Profiles in Elementary School

In the present study, we took an approach similar to that used by Meece and Holt (1993). We used cluster analysis to reanalyze data from an earlier investigation of motivational orientations among elementary and middle school students (Corpus, McClintic-Gilbert, & Hayenga, 2009). We focused on the subset of students in third, fourth, and fifth grades because almost no research to date has identified profiles of intrinsic and extrinsic motivations among elementary school populations (cf. Harter & Jackson, 1992; for constructs similar to intrinsic motivation, see Nurmi & Aunola, 2005; and Patrick, Mantzicopoulos, Samarapungavan, & French, 2008). A developmental perspective is critical for this line of research because the prevalence and optimal combination of motivation types may differ for elementary versus older students. The late elementary years are an important time of transition in students' beliefs about their competence and the criteria they use for assessing that competence (Nicholls & Miller, 1984; Stipek & MacIver, 1989). At the same time, the educational context typically shifts from one focused on growth and mastery in

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an autonomy-supportive frame to one focused on normatively defined performance outcomes in a less relationally supportive manner (Eccles & Wigfield, 2000; Haselhuhn, Al-Mabuk, Gabriele, Groen, & Galloway, 2007; Midgley, Anderman, & Hicks, 1995; Stipek & MacIver, 1989). These social cognitive developments, in turn, likely have implications for the amount of intellectual curiosity students are willing to exhibit, how hard they are willing to work, and the extent to which they are keyed in to the extrinsic constraints of their school environments. Understanding profiles of motivation at the beginning of these transitions may be a step toward designing effective early interventions for motivational problems, making the late elementary years an important focus of study from theoretical and applied perspectives.

In addition to identifying motivational profiles among elementary school students, we aimed to provide a descriptive account of individual differences in motivational change. Are students who begin the year with high levels of motivation more likely to shift profiles over time? Are certain combinations of motives particularly stable or unstable? The original variable-centered investigation of Corpus and colleagues (2009) documented significant declines in both intrinsic and extrinsic motivations over the course of a single academic year. These findings, coupled with robust evidence of age-related declines in intrinsic motivation from other variable-centered studies (e.g., Bouffard, Marcoux, Vezeau, & Bordeleau, 2003; Eccles, Wigfield, & Schiefele, 1998; Gottfried, Fleming, & Gottfried, 2001; Lepper, Corpus, & Iyengar, 2005; Spinath & Steinmayr, 2008), might suggest particular instability in profiles with high levels of intrinsic motivation.

It is likely that some individuals maintain adaptive attitudes toward the learning process or even show motivational gains—patterns that would be obscured by a traditional variable-centered approach. Person-centered research using motivational constructs with adult populations has shown a mixture of movement toward more and less adaptive profiles over time, despite a dominant tendency toward motivational losses (Alexander & Murphy, 1998; Braten & Olaussen, 2005). In the one existing study of profile stability using intrinsic and extrinsic motivational constructs to date, however, there was a fairly dominant pattern of movement toward primarily extrinsic motivation over the course of a middle school year (Hayenga & Corpus, 2010). Whether such a pattern would be obtained with elementary school students is an empirical question. It is possible that shifts toward intrinsic motivation could be observed more readily in the autonomy-supportive and community-spirited context of typical elementary schools (Anderman & Maehr, 1994; Eccles & Wigfield, 2000; Midgley et al., 1995; but see Archambault, Eccles, & Vida, 2010).

Motivational Profiles and Achievement at the Elementary School Level

In addition to identifying the prevalence and stability of motivational profiles at the elementary school level, we aimed to examine their relation with academic achievement. The original variable-centered investigation of Corpus and colleagues (2009) showed that intrinsic motivation was positively related to students' classroom grades and test scores, whereas extrinsic motivation was negatively related to these same indicators of achievement. These findings are consistent with a host of variable-centered studies that generally show intrinsic motivation to be more adaptive than extrinsic motivation (e.g., Deci & Ryan, 2000; Lepper et al., 2005; Sansone & Harackiewicz, 2000; Wolters, Yu, & Pintrich, 1996). It remains unclear, however, how different combinations of the two constructs might function. When considered together, does extrinsic motivation detract from intrinsic motivation or compound its benefits?

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The small number of relevant person-centered investigations to date has focused on high school and college students (i.e., Ratelle et al., 2007; Vansteenkiste et al., 2009; Wormington et al., 2012) and provide a mixed answer to this question. Vansteenkiste and colleagues (2009) found that students with a high ratio of intrinsic motivation to extrinsic motivation outperformed their peers and exhibited a variety of other adaptive self-regulatory tendencies. Two other studies, however, found that exhibiting high levels of intrinsic motivation and extrinsic motivation was equally adaptive and far more prevalent in high school (Ratelle et al., 2007; Wormington et al., 2012). When coupled with intrinsic motivation, then, extrinsic motivation may promote academic achievement in high school, perhaps because of the competitive, outcome-oriented stance common at this level of schooling (Otis, Grouzet, & Pelletier, 2005; Ratelle et al., 2007).

Although the benefits of intrinsic motivation in elementary school have long been documented (Boggiano, 1998; Gottfried, 1985; Lepper et al., 2005; Miserandino, 1996; Otis et al, 2005; Ryan & Connell, 1989), it is less clear how accompanying levels of extrinsic motivation would affect academic functioning. It is possible that elementary school students see little conflict between learning as a means toward pleasing others and learning as an end in itself, in which case any profile with sufficient intrinsic motivation would be adaptive. Preadolescents may experience external constraints as helpful supporting structures rather than as oppressive impediments, given that they are still developing their self-regulatory capabilities (Cooper & Corpus, 2009; Stipek, 2002; Zimmerman & Martinez-Pons, 1990) and autonomy is not yet a central developmental task (Erikson, 1968; Wray-Lake, Crouter, & McHale, 2010). Likewise, they may readily view suggestions and directives from their teachers in a benevolent light given that student–teacher relationships are typically close and supportive at this level of schooling (Eccles & Wigfield, 2000; Feldlaufer, Midgley, & Eccles, 1988; Midgley et al., 1995; Stipek, 2002). From this perspective, children who are intellectually curious but also who are oriented toward adult approval and mindful of extrinsic constraints may perform best in elementary school—or at least no worse than those who endorse intrinsic in the absence of extrinsic motivation. In support of this hypothesis, elementary school students who endorse both mastery and performance goals show achievement outcomes similar to those who primarily endorse mastery goals (Schwinger & Wild, 2012). These findings must be applied cautiously to the present analysis, however, given that achievement goals and motivational orientations are distinct constructs (for a discussion of this issue, see Corpus et al., 2009).

A competing hypothesis is that students with a pattern of high intrinsic motivation but low extrinsic motivation may fare better than others. This possibility is grounded in decades of theory and research indicating that deep, meaningful engagement results when students are free from exogenous concerns (Deci & Ryan, 2002; Harter, 1992; Lepper, Greene, & Nisbett, 1973; Pintrich & DeGroot, 1990). Such primarily intrinsic motivation may be prevalent and sustainable in elementary school because the environment supports the relatively autonomous pursuit of intellectual interests, particularly when considered in contrast with the often controlling environment of middle and high school (Anderman & Maehr, 1994; Eccles & Midgley, 1989; Midgley & Edelin, 1998). Grading practices common at the elementary level, for example, are often informal and based on growth and effort rather than sheer normative standing (Brookhart, 1994; McMillan, Myran, & Workman, 2002; Midgley et al., 1995; Randall & Engelhard, 2009; Stipek & MacIver, 1989), which would support the adaptive nature of primarily intrinsic motivation. It is interesting that recent research with middle school students showed that a pattern of high intrinsic coupled with low extrinsic motivation was associated with higher academic achievement than any other

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combination of motivation types (Hayenga & Corpus, 2010; see also Vansteenkiste et al., 2009). Perhaps such a pattern would be even more pronounced at the elementary level.

In the present study, we examined the extent to which profile membership predicted academic achievement both concurrently and over the course of the academic year. Like previous person-centered studies of intrinsic and extrinsic motivations (e.g., Hayenga & Corpus, 2010; Ratelle et al., 2007; Vansteenkiste et al., 2009), we conceptualized academic achievement in terms of report card grades in order to capture the quality of students' daily classroom work as well as their examination performance. Unlike previous studies, however, we paired this somewhat subjective indicator of achievement with a more objective indicator of learning— scores on state or nationally standardized achievement tests. On the basis of motivation theory and recent findings with middle school students, we expected a profile of primarily intrinsic motivation to be positively associated with both indicators of achievement. However, this hypothesis was tentative given that no person-centered research based within the intrinsic-extrinsic framework has been conducted with elementary school students, and related work within other motivational frameworks has focused largely on older samples (for exceptions, see Schwinger & Wild, 2012; and Veermans & Tapola, 2004).

It is important to note, however, that an association between primarily intrinsic motivation and academic achievement would not reveal the driving force behind that relation. As Hayenga and Corpus (2010) argued, primarily intrinsic motivation may uniquely promote achievement because it encourages deep learning strategies and focused engagement but it is also plausible that high achievers are "accustomed to attaining positive reactions from authority figures quite easily, and thus have the luxury of focusing primarily on task enjoyment and challenge-seeking" (p. 379). We therefore adopted a longitudinal approach in order to begin to address this ambiguity. We hypothesized that motivational profiles in the fall would predict achievement levels in the spring, beyond what might be expected from fall achievement indexes. In support of this hypothesis, Nurmi and Aunola (2005) found that motivational clusters that are based on students' value and interest in a variety of school subjects predicted subsequent achievement but that the reverse was not true. Although lacking the extrinsic motivational component central to the present investigation, their findings suggest that clusters of motivational constructs may have important real-world consequences for learning and achievement.

To summarize, the central goals of the present study were to (a) characterize naturally occurring profiles of intrinsic and extrinsic motivations among elementary school students, (b) describe the stability of such profiles over the course of an academic year, and (c) examine their adaptive value in terms of academic achievement.

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METHOD

Participants

Participants were 507 third- ($n = 151$), fourth- ($n = 157$), and fifth-grade ($n = 199$) students from seven schools (four public, three parochial) in Portland, Oregon. This sample included all elementary school students from the larger dataset reported in Corpus, McClintic-Gilbert, and Hayenga (2009), which used a variable-centered approach to investigate developmental change in motivational processes among third- through eighth-grade students. All children at the appropriate

grade level in each school were invited to participate with 72% of parents providing active consent. The sample for the present study included slightly more girls ($n = 274$) than boys ($n = 230$), with 3 students not reporting gender. The majority of students (84%) were Anglo-American. The participating schools were in working and middle-class neighborhoods, with most of the public schools reporting approximately 25% of students eligible for free or reduced-price lunch (range: 21% to 74%).

Measures

Intrinsic and Extrinsic Motivational Orientations

Motivational orientations were assessed with reliable and valid scales from Corpus and colleagues (2009), which were based on Lepper and colleagues' (2005) study. These scales derive from Harter's (1981) classic research on intrinsic motivational orientation and are built on a tradition that has been prominent in research with child populations (e.g., Guay, Boggiano, & Vallerand, 2001; Lepper et al., 2005; Tzuriel, 1989; Wong, Wiest, & Cusick, 2002). In contrast with Harter's original measure, however, the scales assess intrinsic and extrinsic forms of motivation independently of one another. The intrinsic motivation scale included 17 items focusing on the dimensions of independent mastery (e.g., "I like to do my schoolwork without help"), challenge-seeking (e.g., "I like to go on to new work that's at a more difficult level"), and curiosity-driven engagement (e.g., "I ask questions in class because I want to learn new things"). On the basis of a number of conceptual analyses, these dimensions are thought to tap children's desire to engage in schoolwork as an end in itself (see Lepper & Henderlong, 2000). The dimension of independent mastery, for example, is arguably grounded in White's (1959) analysis, which maintains that children are motivated to master their environments simply for the pleasure of accomplishment. Moreover, the autonomous origin of such behaviors is a central tenet of the self-determination model of intrinsic motivation (e.g., Deci & Ryan, 1985, 2000). The dimension of challenge-seeking is rooted in Harter's (1978) extension of White's model, which specified that challenging work is essential for producing the rewarding feeling of efficacy that characterizes intrinsic motivation. Last, the dimension of curiosity can be traced to the classic work of Berlyne (1960, 1966), who argued that individuals are naturally motivated to engage in exploratory behavior, independent of extrinsic constraints. Mastery attempts, challenge-seeking, and curiosity-driven engagement, therefore, collectively describe behaviors undertaken for reasons of pleasure or enjoyment—that is, behaviors that are intrinsically motivated.

The extrinsic motivation scale included 16 items focusing on an orientation toward pleasing authority figures (e.g., "I answer questions because the teacher will be pleased with me"), a desire for easy work (e.g., "I like school subjects where it's pretty easy to just learn the answers"), and a dependence on the teacher for guidance (e.g., "I like the teacher to help me plan what to do next"). These dimensions were originally constructed as the contrasting halves of each of the intrinsic dimensions described earlier (Harter, 1981). As Corpus and colleagues (2009) argued, the dimension of pleasing others perhaps most clearly taps children's desire to engage in schoolwork as a means to some extrinsic end, and is consistent with the construct of controlled motivation as conceptualized by self-determination theory (e.g., Deci & Ryan, 2000; Ryan & Deci, 2000). The dimensions of easy work and dependence on the teacher may be best conceptualized as symptoms of extrinsic motivation in that their presence is a means of inferring that children are

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engaging in schoolwork for its instrumental value (see Corpus et al., 2009). A dependence on the teacher, for example, may often be indicative of a desire to complete work in a fashion that will satisfy the authority figure to the point of earning rewards. A dependence on the teacher could also represent help-seeking in its various forms rather than extrinsic motivation per se (e.g., Ryan, Patrick & Shim, 2005), but we retained the dimension in the present study to be consistent with prior variable-centered research (e.g., Corpus et al., 2009; Lepper et al., 2005).[1]

Children responded to each of the intrinsic and extrinsic motivation items using a 5-point scale, ranging from 1 (*not like me at all*) to 5 (*exactly like me*). Scores were averaged together to form composite variables of intrinsic motivation (fall $\alpha = .91$; spring $\alpha = .90$) and of extrinsic motivation (fall $\alpha = .85$; spring $\alpha = .87$). The use of these composite variables was justified by hierarchical confirmatory factor analyses from Corpus and colleagues (2009) and is consistent with the approach taken by investigators using Harter's original scale (e.g., Boggiano, 1998; Ginsburg & Bronstein, 1993; Harter & Jackson, 1992; Ryan & Connell, 1989; Tzuriel, 1989). In the case of intrinsic motivation, moreover, the use of a composite index echoes White's (1959) contention that both curiosity and mastery are rooted in a central desire to interact effectively with one's environment. Focusing on composite variables as the unit of analysis, however, was largely a pragmatic decision made for the sake of parsimony and consistency with prior research.

Academic Achievement

Academic achievement was indexed by both report card grades and more objective standardized test scores. Grades were collected from school records for the core academic subjects of language arts, math, social studies, and science. Because grading systems varied across the participating schools, all grades were converted to a standard 4-point scale (e.g., A = 4.0, A– = 3.7, B+ = 3.3) and then averaged together to compute a GPA. Standardized test scores were based on the Stanford Achievement Test (10th ed.) in the parochial schools and the Oregon Statewide Assessment in the public schools. In both cases, percentile scores on the reading and mathematics portions of the tests were averaged together to form a composite index.

Procedure

Students completed surveys that included the measures of intrinsic and extrinsic motivation as well as others unrelated to the present study two times during the academic year— once in the fall and once in the spring. At each time point, surveys were administered in students' classrooms during regular school hours by trained research assistants. Before survey administration, students were given folders to prop up on their desks to create a private space and they were assured that their responses would be kept confidential. They were then taught to use the 5-point response scale using sample items unrelated to school or motivation. Each survey item was read aloud twice for third-grade students and once for fourth- and fifth-grade students. After hearing each item, students responded quietly at their desks. Several research assistants circled the room and students were encouraged to raise their hands to ask questions if needed. Once surveys were completed, students were thanked and invited to keep the folder as a token of appreciation. The

[1]Analyses conducted using only the dimension of pleasing authority figures as the measure of extrinsic motivation showed a pattern of findings very similar to that reported in the Results section.

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entire procedure lasted approximately 30 min. Report card grades were subsequently collected from school records for the first and fourth quarters of the academic year in order to parallel the timing of the fall and spring student surveys. Standardized achievement tests were collected for the single yearly administration in the spring, which corresponded roughly to the timing of the spring student survey.

Statistical Analysis Strategy

To capture naturally occurring combinations of intrinsic and extrinsic motivations for both the fall and spring time points, we used I-States as Objects Analysis (Bergman & El-Khouri, 1999). This technique was chosen, in part, because it is ideal for studying short-term motivational change such as that which might take place over a single academic year (Bergman & El-Khouri, 1999; cf. Nurmi & Aunola, 2005). Following dynamic systems models, I-States as Objects Analysis treats each participant's data from a single time point as a discrete unit—an i-state. Thus, fall and spring responses from the 507 participants were separated into 1014 i-states, and each included a single score for intrinsic motivation and a single score for extrinsic motivation. These i-states were used as the input for cluster analysis, the goal of which was to identify groups with members that are highly similar to one another and also distinct from members of other groups in their levels of intrinsic and extrinsic motivations. Thus, cluster analysis aims to maximize within-group homogeneity and between-group heterogeneity.

Because cluster analysis is highly sensitive to outliers in the data, we first tested for multivariate outliers using the procedure outlined by Hadi (1992, 1994). We also examined the data for univariate outliers defined as any value of intrinsic or extrinsic motivation greater than ± 2.5 standard deviations from the mean. Once outliers were removed, the remaining i-states were subjected to an agglomerative hierarchical clustering method (Ward's linkage) followed by a nonhierarchical, iterative clustering technique (k-means clustering; see Bergman, 1998; Hair, Anderson, Tatham, & Black, 1998).

In the first step, Ward's linkage was used to combine i-states into clusters using average squared Euclidean distance as the measure of similarity (see Aldenderfer & Blashfield, 1984; Hair et al., 1998). Using this procedure, each i-state begins as its own cluster. The two closest clusters are then combined with one another, and this process repeats until all the i-states are combined into one large cluster. The optimal cluster solution is chosen by considering a priori motivational theory, distinctness of the clusters, percent of variance in intrinsic and extrinsic motivation explained, and concerns of parsimony. Because related studies with older populations have found a four-cluster solution (Hayenga & Corpus, 2010; Vansteenkiste et al., 2009) and based on an examination of the agglomeration schedule, we considered solutions with three, four, and five clusters to be the most viable candidates. In the second step, a nonhierarchical k-means clustering was used to fine-tune the cluster solution. In k-means analysis, the number of clusters to be extracted and the cluster seed for each are specified in advance. I-states are then reassigned to clusters to maximize cluster homogeneity. In the present study, we used cluster centroids from the hierarchical procedure as non-random starting points for the k-means analysis.

Once the cluster solution was selected and fine-tuned, we employed a double-split cross-validation procedure to ensure that it was stable and replicable (Breckenridge, 2000). In this procedure, the dataset is randomly split into two halves. The two-step clustering procedure (Wards followed by k-means) is then performed separately on each half. I-states from each half

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are then reclassified according to the cluster assignment of their nearest neighbor in the other half. Cohen's kappa is used to compare each half's original cluster solution to this reclassified solution. We also performed a second validation procedure in order to verify that the cluster solution was appropriate for both the fall and spring data. Rather than splitting the i-state data randomly, we used the fall and spring sample as the two halves and continued with the validation procedure as described earlier.

Following cluster validation, we reorganized the data by participant rather than i-state, with each participant assigned to both a fall cluster and a spring cluster. This permitted an examination of stability and change in cluster membership over time. Analysis of variance and post hoc comparisons were then used to test cluster membership as a predictor of academic achievement both concurrently and prospectively.

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RESULTS

Academic achievement data were unavailable for a small number of students (< 6% of the sample), typically because their parents did not grant access to school records. It is important to note that these students did not differ in their levels of intrinsic or extrinsic motivations in either the fall or spring from the remainder of the sample for whom achievement data were available, $ts(505) < 1.54$, *ns*. Beyond this, there were very few cases of missing data. When students left a particular item from the motivation scales blank (< 1% of total responses), composite variables were calculated by averaging the values of the completed items for that measure.

Correlations and Preliminary Analysis

Descriptive statistics are presented by gender and grade level as well as for the overall sample in Table 1. The relatively small negative correlations between intrinsic and extrinsic motivations support the argument that they are largely orthogonal constructs. Correlations between each type of motivation and the achievement measures were consistent with the extant variable-centered literature (e.g., Lepper et al., 2005). The temporal stability of the constructs from fall to spring was relatively high.

Cluster Analysis

There were no multivariate outliers, but 17 univariate outliers were removed, leaving a final sample of 490 participants (980 i-states) for cluster analysis. On the basis of Ward's linkage, a three-cluster solution was chosen. This solution explained 55% of the variance in intrinsic motivation, 60% of the variance in extrinsic motivation, and 57% of the total variance—all above the threshold of 50% used in related studies (Hayenga & Corpus, 2010; Vansteenkiste et al., 2009). The three clusters represented theoretically meaningful combinations of intrinsic and extrinsic motivations, as later described. Although the four-cluster solution explained slightly more total variance (64%), the groups did not differ sufficiently from one another (i.e., three of the four clusters evidenced minimal deviation from the grand mean for at least one motivational dimension). Moreover, the additional profile gained in the four-cluster solution did not map meaningfully onto motivation theory in that it split a group with high levels of both intrinsic and extrinsic motivations into one

TABLE 1
Descriptive Statistics and Correlations

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Motivation							
Intrinsic motivation							
1. Fall	(.91)						
2. Spring	.59**	(.90)					
Extrinsic motivation							
3. Fall	−.16**	−.26**	(.85)				
4. Spring	−.18**	−.25**	.64**	(.87)			
Achievement							
GPA							
5. Fall	.11*	.13**	−.35**	−.34**	—		
6. Spring	.11*	.17**	−.36**	−.35**	.82**	—	
7. Spring standardized test	.11*	.09*	−.39**	−.36**	.65**	.67**	—
M (*SD*)							
Overall sample	3.60 (0.74)	3.54 (0.70)	3.22 (0.72)	3.07 (0.74)	2.99 (0.73)	3.19 (0.70)	69.42 (23.42)
Boys	3.66 (0.70)	3.57 (0.68)	3.21 (0.72)	3.08 (0.73)	2.91 (0.74)	3.10 (0.72)	69.01 (23.24)
Girls	3.65 (0.64)	3.59 (0.59)	3.20 (0.69)	3.04 (0.74)	3.08 (0.69)	3.29 (0.66)	70.36 (23.80)
Third grade	3.76 (0.72)	3.59 (0.66)	3.36 (0.76)	3.21 (0.77)	3.05 (0.71)	3.27 (0.64)	74.17 (21.98)
Fourth grade	3.69 (0.69)	3.70 (0.65)	3.23 (0.65)	3.08 (0.74)	2.84 (0.74)	3.06 (0.77)	66.50 (25.09)
Fifth grade	3.57 (0.62)	3.47 (0.61)	3.04 (0.66)	2.91 (0.67)	3.11 (0.68)	3.29 (0.62)	68.86 (22.92)

Note. Values in parentheses on the diagonal of the correlation matrix are alpha coefficients.
* $p < .05$. ** $p < .01$.

high-intrinsic/moderate-extrinsic group and one moderate-intrinsic/high-extrinsic group. These problems were exacerbated with the five-cluster solution, which was also less parsimonious. Last, moving to a four- or five-cluster solution did not add substantial information in terms of profile adaptiveness or stability of clusters. The k-means procedure was used, therefore, to construct a final solution that is based on three clusters, which explained 56% of the variance in intrinsic motivation, 62% of the variance in extrinsic motivation, and 59% of the total variance. The double-split cross-validation procedure confirmed that the three-cluster solution was stable and replicable using two randomly selected halves ($\kappa = .86$) as well as the fall/spring halves ($\kappa = .86$).[2]

Description of the Final Solution

The final solution included a *high-quantity* group that reported high levels of intrinsic and extrinsic motivations (281 i-states), a *primarily intrinsic* group that reported high intrinsic motivation but low extrinsic motivation (362 i-states), and a *primarily extrinsic* group that reported low intrinsic motivation but high extrinsic motivation (337 i-states). Figure 1 presents *z* scores

[2]Cluster analyses were also conducted separately for each of the three grade levels. A final solution of three clusters was appropriate at each grade level, explaining sufficient variance in intrinsic (third grade: 56.4%; fourth grade: 57.9%; fifth grade: 60.9%) and extrinsic (third grade: 60.7%; fourth grade: 62.5%; fifth grade: 61.5%) motivation. All subsequent analyses, therefore, are based on the cluster solution for the entire sample.

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of intrinsic and extrinsic motivations for each cluster in the fall (top graph) and spring (bottom graph). The *z* scores indicate moderate to strong deviations from the mean in levels of both intrinsic and extrinsic motivations, demonstrating that the groups differed meaningfully from one another.

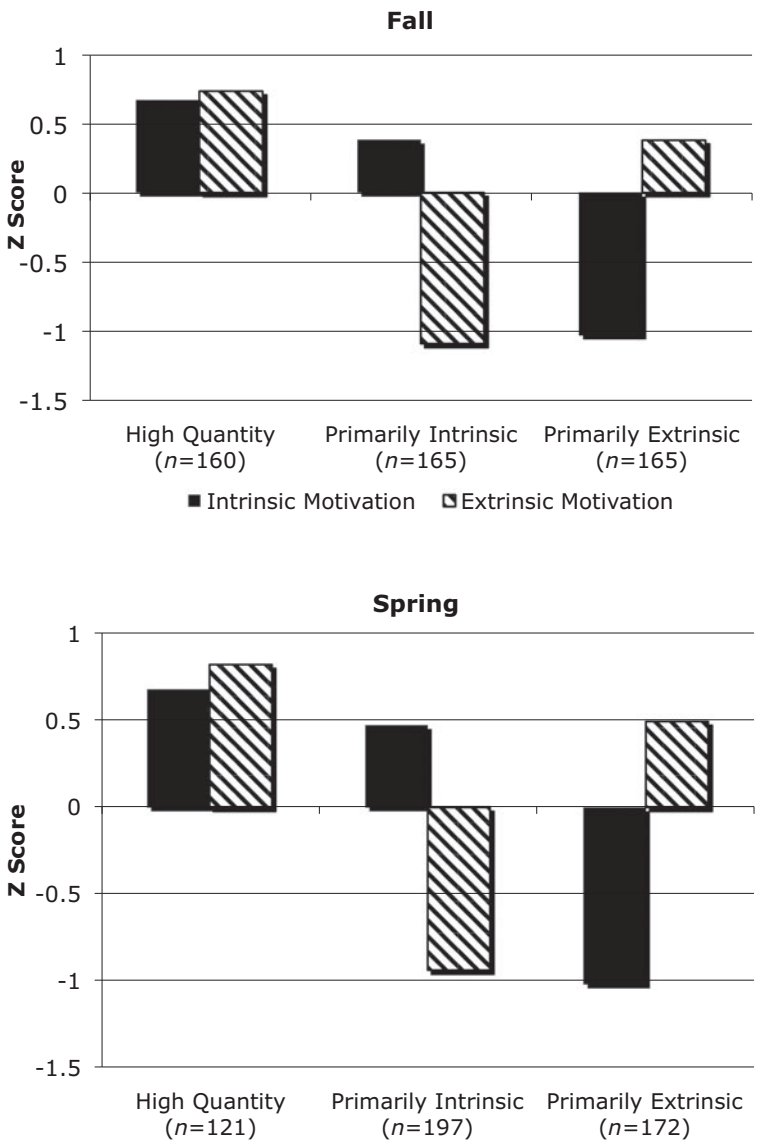

FIGURE 1 *Z* scores by cluster for fall and spring.

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We next examined the data for systematic differences in gender and grade level across clusters in both the fall and spring. There were no differences in gender distribution across the three clusters at either time point, χ^2s$(2, N = 487) < .94$, *ns*. There were, however, differences by grade level at both time points, χ^2s$(4, N = 490) > 14.32$, *p*s $< .01$. Adjusted standardized residuals indicated that third- and fourth-grade students were overrepresented in the high-quantity cluster. Fifth-grade students, in contrast, were underrepresented in the high-quantity cluster and overrepresented in the remaining two clusters. Because grade level was not systematically correlated with the achievement indices, we did not include it in the analyses reported below for the sake of parsimony. Repeating these analyses with grade level as a covariate did not change the pattern of findings or significance levels reported.

Profile Stability

We first examined patterns of stability and change in profile membership for the entire sample. Overall the clusters were moderately stable with 62% of the sample remaining in the same profile from fall to spring. As shown in Table 2, however, the clusters varied in their degree of stability. While the majority of students in the primarily intrinsic cluster remained in that same profile from fall to spring, most of those in the high-quantity cluster shifted into one of the other groups over the course of the year. When students changed cluster membership, they were most likely to move into the primarily intrinsic and primarily extrinsic groups and least likely to evolve toward

TABLE 2
Longitudinal Shifts in Cluster Membership

Fall cluster	*1*	*2*	*3*	*Total*
Overall sample				
1. High quantity	72 (45.0%)	43 (26.9%)	45 (28.1%)	160
2. Primarily intrinsic	20 (12.1%)	125 (75.8%)	20 (12.1%)	165
3. Primarily extrinsic	29 (17.6%)	29 (17.6%)	107 (64.8%)	165
Total	121	197	172	490
Third grade				
1. High quantity	30 (49.2%)	14 (23.0%)	17 (27.9%)	61
2. Primarily intrinsic	6 (15.0%)	29 (72.5%)	5 (12.5%)	40
3. Primarily extrinsic	11 (25.6%)	7 (16.3%)	25 (58.1%)	43
Total	47	50	47	144
Fourth grade				
1. High quantity	29 (55.8%)	14 (26.9%)	9 (17.3%)	52
2. Primarily intrinsic	6 (13.0%)	34 (73.9%)	6 (13.0%)	46
3. Primarily extrinsic	13 (25.0%)	11 (21.2%)	31 (59.6%)	55
Total	48	59	46	153
Fifth grade				
1. High quantity	13 (27.7%)	15 (31.9%)	19 (40.4%)	47
2. Primarily intrinsic	8 (10.1%)	62 (78.5%)	9 (11.4%)	79
3. Primarily extrinsic	5 (7.5%)	11 (16.4%)	51 (76.1%)	67
Total	26	88	79	193

Note. Values in parentheses are the percentages of each fall cluster that appear in the various spring clusters.

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the high-quantity group. The ratio of new member gains to old member losses was highest for the primarily intrinsic cluster (1.8:1) and lowest for the high-quantity cluster (.56:1).

We also examined profile stability separately for third-, fourth-, and fifth-grade students. As shown in Table 2, patterns of stability and change at each of the three grade levels generally mirrored those of the full sample: profile membership was moderately stable over the school year (third grade: 58.3%; fourth grade: 61.4%; fifth grade: 65.3%), with the most stability in the primarily intrinsic cluster and the least stability in the high-quantity cluster. There were two slight differences, however, between students in fifth grade and their younger counterparts. First, the high-quantity cluster was particularly unstable among fifth-grade students (27.7% stability) as compared with third- (49.2% stability) and fourth- (55.8% stability) grade students; the ratio of new member gains to old member losses was lower for the fifth-grade high-quantity cluster than for any other cluster at any grade level (.38:1). Second, the primarily extrinsic cluster was particularly stable among the fifth-grade students, at levels that nearly matched that of the primarily intrinsic cluster. More than three -quarters of fifth-grade students in the primarily extrinsic cluster remained in that same profile from fall to spring.

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Academic Achievement

GPA

As predicted, students in the primarily intrinsic cluster outperformed their peers in the other two clusters at both the fall, $F(2, 465) = 28.88$, $p < .001$, $\eta_p^2 = .11$, and spring, $F(2, 465) = 30.91$, $p < .001$, $\eta_p^2 = .12$, time points. Students with primarily intrinsic motivation scored in or above the B+ range (fall $M = 3.33$, $SE = 0.05$; spring $M = 3.49$, $SE = 0.05$), whereas those with high-quantity (fall $M = 2.87$, $SE = 0.06$; spring $M = 3.00$, $SE = 0.06$) and primarily extrinsic (fall $M = 2.79$, $SE = 0.06$; spring $M = 3.01$, $SE = 0.05$) motivation scored in the B- range. Independent t tests confirmed that the difference between the primarily intrinsic and high-quantity clusters was significant at the fall, $t(308) = 6.39$, $p < .001$; and spring, $t(303) = 6.56$, $p < .001$, time points. Likewise, the difference between the primarily intrinsic and primarily extrinsic clusters was significant at the fall, $t(315) = 7.33$, $p < .001$; and spring, $t(352) = 7.43$, $p < .001$, time points. The high-quantity and primarily extrinsic clusters did not, however, differ from one another at either time point: fall $t(307) = .89$, $p = .37$, spring $t(275) = .04$, $p = .97$.

Moving beyond concurrent associations, we next tested the relationship between cluster membership and achievement over time. An analysis of covariance revealed a statistically significant effect of fall cluster membership on spring GPA, controlling for fall GPA, $F(2, 464) = 3.08$, $p = .047$, $\eta_p^2 = .01$. As expected, the primarily intrinsic group experienced the greatest increase in achievement over the course of the school year. Post hoc pairwise comparisons showed that students with primarily intrinsic motivation in the fall performed better in the spring ($M = 3.27$, $SE = 0.03$) than those with high-quantity motivation ($M = 3.16$, $SE = 0.03$; $p = .017$) and marginally better than those with primarily extrinsic motivation ($M = 3.18$, $SE = 0.03$; $p = .069$). There was no difference between students with high-quantity and primarily extrinsic motivation, $p = .56$.

Last, we examined achievement across time for the subsample of students who remained in the same profile from fall to spring (62%, $n = 290$). Controlling for prior achievement, profile membership was a marginally significant predictor of academic achievement in the spring,

$F(2, 286) = 2.84$, $p = .06$, $\eta_p^2 = .02$. Pairwise comparisons revealed that students in the primarily intrinsic profile ($M = 3.28$, $SE = 0.04$) displayed significantly better spring performance than their classmates in the high-quantity profile ($M = 3.13$, $SE = 0.05$), $p = .021$, but not the primarily extrinsic ($M = 3.19$, $SE = 0.04$) profile, $p = .105$. Students with high-quantity and primarily extrinsic motivation did not differ in their adjusted spring GPAs, $p = .371$. Across both concurrent and longitudinal analyses, then, the adaptive value of primarily intrinsic motivation was clear.

Standardized Test Scores

Because tests were only administered once each year in the spring, we examined the concurrent relation between spring cluster membership and spring test performance. Students in the primarily intrinsic cluster ($M = 79.10$, $SE = 1.61$) outperformed their peers in the high-quantity ($M = 61.50$, $SE = 2.11$) and primarily extrinsic ($M = 64.40$, $SE = 1.74$) clusters, $F(2, 459) = 29.18$, $p < .001$, $\eta_p^2 = .11$. Strikingly, the advantage of primarily intrinsic motivation amounted to nearly 15 percentile points. Independent t-tests confirmed a statistically significant advantage for the primarily intrinsic cluster relative to both high-quantity, $t(298) = 6.82$, $p < .001$, and primarily extrinsic, $t(349) = 6.40$, $p < .001$, clusters. The latter two groups did not differ from one another, $t(271) = .99$, $p = .32$.

We next turned to the question of relations over time. Because there were no standardized test scores in the fall to use as a baseline indicator of performance, we substituted fall GPA as the covariate in an analysis of covariance assessing the effect of fall cluster membership on spring test performance. As might be expected, there was a statistically significant effect of cluster membership on achievement, $F(2, 458) = 10.01$, $p < .001$, $\eta_p^2 = .04$. Post hoc pairwise comparisons revealed that students with primarily intrinsic motivation in the fall performed better ($M = 75.05$, $SE = 1.44$) on standardized achievement tests the following spring than their peers with high-quantity ($M = 67.24$, $SE = 1.44$; $p < .001$) and primarily extrinsic ($M = 66.66$, $SE = 1.42$; $p < .001$) motivation, even after adjusting for fall GPA. Adjusted standardized test scores for the high-quantity and primarily extrinsic groups did not differ, $p = .773$.

For students who remained in the same motivational profile from fall to spring ($n = 286$), an analysis of covariance controlling for prior achievement indicated significant differences in achievement between the profiles, $F(2, 282) = 10.95$, $p < .001$, $\eta_p^2 = .07$. Once again, pairwise comparisons showed that students in the primarily intrinsic profile ($M = 75.92$, $SE = 1.65$) had higher standardized test scores than students in the high-quantity ($M = 63.81$, $SE = 2.14$; $p < .001$) and primarily extrinsic ($M = 66.93$, $SE = 1.73$; $p < .001$) profiles. The latter two groups did not differ from one another, $p = .245$.

DISCUSSION

In the present study, we undertook a person-centered reanalysis of data from Corpus and colleagues (2009) to examine naturally occurring combinations of intrinsic and extrinsic motivations among elementary school students. The results of the cluster analysis support conclusions drawn from the original variable-centered investigation but also identify several important nuances in our understanding of young students' motivational orientations.

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First, despite the robust association between intrinsic motivation and academic achievement in Corpus et al. and the broader variable-centered literature (e.g., Guthrie et al., 2006; Lepper et al., 2005; Ryan & Deci, 2000; Sansone & Harackiewicz, 2000), not every profile with substantial intrinsic motivation had an achievement advantage in the present study. In particular, it was the primarily intrinsic profile—and not the high-quantity profile—that predicted the strongest academic achievement. Moreover, the high-quantity profile did no better than the primarily extrinsic profile despite being characterized by markedly higher levels of intrinsic motivation. Viewed through the lens of motivational profiles, then, perhaps the absence of extrinsic motivation is more critical than the presence of intrinsic motivation in directing the relation between motivation and achievement.

Second, our person-centered approach revealed a more optimistic picture of developmental change in motivation than that of previous variable-centered research. Corpus et al. and many other variable-centered studies (e.g., Gottfried et al., 2001; Harter, 1981; Lepper et al., 2005), have shown robust losses to intrinsic motivation over time, and the present study showed considerable movement away from the high-quantity profile over the course of the year. At the same time, the popularity and stability of the primarily intrinsic cluster suggests that a substantial number of children are able to maintain a high ratio of intrinsic to extrinsic motivation during the late elementary school years even if there are losses to intrinsic motivation in the aggregate.

Last, and most fundamental, the present study identified the combinations of motivation that exist among elementary school students—an issue that Corpus and colleagues and variable-centered studies do not address. The present findings partially replicated the profile solutions from related studies with older students (Hayenga & Corpus, 2010; Vansteenkiste et al., 2009; Wormington et al., 2012) but also revealed patterns unique to the elementary school level, which are considered more fully below.

Nature and Stability of Clusters at the Elementary School Level

Whereas a four-cluster solution has been dominant in research with middle and high school students (i.e., Hayenga & Corpus, 2010; Vansteenkiste et al., 2009; Wormington et al., 2012), we selected a three-cluster solution for the present elementary school sample. Our three clusters resembled those reported in studies with older students, but we did not find a fourth cluster of children who reported low levels of both intrinsic and extrinsic motivations. Perhaps the absence of such a *low-quantity* group is due to the structure of elementary school, in which students spend the vast majority of time under the instruction of a single teacher to whom they are accountable and with whom they develop close personal relationships. Under such conditions it would seem difficult to disengage entirely from school. This stands in contrast with the relatively anonymous high school environment where students cycle through a half-dozen classrooms each day and academic disengagement is commonplace (Martin, 2009; Otis et al., 2005; Willms, 2003). Developmental and contextual factors are confounded (see Stipek & MacIver, 1989) so it is unclear whether the absence of low-quantity motivation among third- through fifth-grade students would persist in a different schooling context.

Another notable departure from research with older students is the high membership in the primarily intrinsic cluster, which was the most populated cluster in the present study but among the least populated clusters in recent studies with both middle school (Hayenga & Corpus, 2010) and high school (Vansteenkiste et al., 2009; Wormington et al., 2012) students. Perhaps students

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in the later school years experience an increasing sense of pressure to gain admission to college or find postsecondary employment. In this context, it may be difficult for older students to largely ignore extrinsic concerns in favor of primarily intrinsic motives.

The primarily intrinsic profile of the present study was also the most stable over time and had the highest ratio of new member gains to old member losses across all three grade levels. This movement toward primarily intrinsic motivation is somewhat surprising given the clear shift toward primarily extrinsic motivation over time among middle school students (Hayenga & Corpus, 2010) and the general pattern of declining intrinsic motivation shown in the original variable-centered investigation (Corpus et al., 2009). It is interesting to note, however, that the primarily extrinsic cluster was more stable among students in fifth grade compared with their younger counterparts in the present sample, suggesting a possible developmental trend. It also may be the case that the growth-based grading practices and autonomy support common in elementary school enable positive motivational shifts to an extent not possible in a typical middle school environment (see Anderman & Maehr, 1994; Eccles & Wigfield, 2000; Midgley et al., 1995). Regardless of its underlying cause, we regard this as an encouraging message about motivation in elementary school. We also regard it as a call for additional longitudinal research on changes in the ratio of intrinsic to extrinsic motivation in addition to the traditional focus on changes in intrinsic motivation per se, which generally reveals a more alarming pattern of motivational loss (e.g., Bouffard et al., 2003; Gottfried et al., 2001; Lepper et al., 2005).

In contrast with the primarily intrinsic profile, the high-quantity profile was more transitory at all grade levels, but particularly among the sample of fifth-grade students. It is interesting to note that those students initially endorsing intrinsic and extrinsic motives were just as likely to shift toward an eventual focus on intrinsic motivation as an eventual focus on extrinsic motivation. Possessing high levels of both types of motivation, then, does not appear to set students up for a pattern that is clearly adaptive or maladaptive. It does, however, appear to be difficult to sustain over time, perhaps because it requires the stressful pursuit of competing goals. The fact that the high-quantity profile was particularly unstable for fifth-grade students in the present study and middle school students in related research (Hayenga & Corpus, 2010) may indicate that intrinsic and extrinsic goals are especially difficult to balance as students mature. Future research on the stability of profiles at the high school level is needed to shed light on possible developmental factors at play. It is interesting to note that related work from achievement goal theory indicates that high school students who pursue multiple goals simultaneously (e.g., outperforming others, earning high grades, and mastering the content) report a significant amount of psychological distress including emotional exhaustion (Tuominen-Soini, Salmela-Aro, & Niemivirta, 2008). Perhaps emotional exhaustion could lead to shifts in profile membership over time as well.

Motivational Profiles and Academic Achievement

The association between high academic achievement and a profile characterized by primarily intrinsic motivation echoes recent person-centered research with middle school students and does so with more objective indicators of learning (Hayenga & Corpus, 2010; for analogous findings in achievement goal theory, see Jang & Liu, 2012; Meece & Holt, 1993). One might imagine that teacher-assigned grades are influenced not only by actual achievement but also by characteristics of motivation itself (e.g., intellectually curious students may elicit higher grades regardless of actual learning), thus the inclusion of more objective standardized test scores provides important

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validation of the primarily intrinsic group's achievements. Moreover, the longitudinal approach of the present study provides a window for understanding the causal role of motivational profiles in academic achievement, which is a step beyond previous research. Our findings indicate that a predominance of intrinsic motivation is not merely a byproduct of high achievement but predicts gains in such achievement over time. This effect was small in magnitude, however, and requires replication in future research.

The adaptive value of primarily intrinsic motivation is not surprising given decades of theory and research on the advantages of intrinsic motivation and the potential costs of extrinsic motivation (e.g., Becker, McElvany, & Kortenbruck, 2010; Deci & Ryan, 1985; Harter, 1992; Lepper et al., 1973; Ryan & Deci, 2000; Sansone & Harackiewicz, 2000). At the same time, however, the benefits of a primarily intrinsic profile were not self-evident given the mixed evidence from research with older populations (e.g., Ratelle et al., 2007; Vansteenkiste et al., 2009; Wormington et al., 2012). Moreover, one could easily imagine that children in elementary school would thrive when motivated by both intrinsic and extrinsic forces. The few extant person-centered studies of elementary-aged students in the achievement goal tradition indicate that those who endorse high levels of mastery and performance goals fare equally well academically (Schwinger & Wild, 2012) and may be more prevalent (Veermans & Tapola, 2004) than those who endorse mastery goals alone. Thus, documenting the performance advantage of a primarily intrinsic profile over a high-quantity profile at the elementary level is a useful addition to the literature.

Students with high-quantity motivation not only performed worse than those with primarily intrinsic motivation but also performed no better than those with primarily extrinsic motivation. Perhaps the presence of extrinsic motivation at sufficient levels overwhelms or renders irrelevant the benefits typically associated with intrinsic motivation (Bem, 1972; Deci, Koestner, & Ryan 1999; Lepper et al., 1973; Smith, 1975). The surprisingly good performance of the primarily extrinsic profile may also be specific to the elementary-aged sample of the present study. In the supportive context of close teacher–student relationships common to this level of schooling (Eccles & Wigfield, 2000; Midgley et al., 1995), academic engagement may come even without intellectual curiosity. A profile of primarily extrinsic motivation, however, may lose its effectiveness as students get older and their relationships to authority figures shift. High school students with primarily extrinsic motivation do perform substantially worse than their peers with high-quantity motivation (Ratelle et al., 2007; Vansteenkiste et al., 2009; Wormington et al., 2012), although it is difficult to make comparisons across studies with different age groups using different measures of motivation and conducted in different educational contexts. Future research must determine how developmental factors and educational contexts interact to define the relation between motivation and achievement.

Limitations

We must also consider the limitations of the present study. Perhaps most notably, the correlational nature of the data prevents conclusions regarding causality. Although our longitudinal approach provides a window for understanding the causal role of motivational profiles, we cannot rule out the possibility of third variables. A second limitation stems from our use of cluster analysis, which involves decisions that are informed by both theory and data but that are nonetheless somewhat subjective. Although we favored a three-cluster solution because it mapped most meaningfully onto motivation theory, one could also make a case for a four-cluster solution in that it explained

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more variance and may have revealed motivational profiles unique to the elementary level. There is a delicate balance to strike between supporting and challenging our existing theories when deciding upon the number of clusters to retain. A related issue is the removal of outliers, which is a requirement for hierarchical approaches to forming clusters (Bergman et al., 2003). While this decision is analytically sound, it precluded us from examining students at the motivational extremes who could potentially reveal nuances in the relation between motivation and achievement (e.g., perhaps an extremely high level of extrinsic motivation spurs exceptional achievements). Future studies might examine students at these extremes, rather than eliminating them from analyses. A final limitation is the small magnitude of effects for the longitudinal analyses, which limits the practical significance of these findings.

Future research employing experimental or intervention designs would be illuminating and could address some of these limitations. Conducting such research at the elementary school level may be particularly informative given that students' motivational patterns in the early years tend to intensify over time (see Skinner, Kindermann, Connell, & Wellborn, 2009). The elementary school years may represent a critical juncture for promoting adaptive motivation in order to stave off the motivational declines typically associated with the transitions to middle and high school. Doing so using a person-centered frame may be particularly useful for practitioners, who focus on the entire constellation of motives as they cohere in real students.

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