Parental Support for Learning and High School Students' Academic Motivation and Persistence in Mathematics

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Abstract

This study tested whether student-perceived at-home parental support for learning is associated to students' personal goal orientations and persistence in mathematics in the classroom. Self-report questionnaire data was collected from 1,534 grade-nine students attending three ethnically-diverse high schools in the southeastern United States. Results of a full structural equation model indicated that students' perception of at-home parental support for learning is strongly associated with students' personal mastery and performance approach goal orientations. All variables, in turn, accounted for 64% of the sample variance in self-reported persistence in mathematics in the classroom. These findings indicate that at-home parental support for learning is significantly positively associated with students' academic motivation and persistence for mathematics in the classroom, which, in the long run, may improve high school students' mathematics achievement.

Keywords: mathematics, persistence, parental support, academic motivation

1. Introduction

Parental involvement is a complex construct associated with student success (Seginer, 2006). It has been found to relate to several beneficial academic and non-academic outcomes for students, such as increased life satisfaction (Siddall, Huebner, & Jiang, 2013), higher self-efficacy and intrinsic motivation (Fan & Williams, 2010), reduced risk of suicide attempts in the absence of close friendship with peers (Hall-Lande, Eisenberg, Christenson, & Neumark-Sztainer, 2007), and academic achievement (Chen, 2008). Interestingly, students' expectations of future academic success was found to be more accurately predicted by parental perceptions of their ability and needed effort than by their own previous performance (Frome & Eccles, 1998). Parental aspirations were found to be a positive predictor of completion of a college degree for low socioeconomic status first generation students (Gofen, 2009). Evidently, various forms of parental involvement yield benefits for children.

While the importance of parental involvement in the academic success of students cannot be refuted, it is important to tease out the specific parental behaviors related to school achievement (Gonzalez & Wolters, 2006). Though there is a consensus about the importance of parental behaviors, there is ambiguity in the literature surrounding type and extent of parental behaviors that lead to school success (Easton, 2010; Fan & Williams, 2010; Finn, 1998; Grolnick & Slowiaczek, 1994). The mismash of parental involvement construct definitions and varied operationalizations have resulted in difficulty with the synthesis of this literature (Fan & Chen, 2001; Hill & Tyson, 2009). Epstein and Sanders (2002) suggest that the myriad ways in which parental involvement may be studied could be divided into at-home or at-school parental involvement practices. In a review of 52 articles on parental involvement in urban areas, Jeynes (2007) found that parental expectations and parenting style were more strongly related to student outcomes than parental involvement in school. Jeynes (2010) suggests that home-based parental involvement is more important for school success than parental school-based involvement.

Parental home involvement is a broad construct, and a range of relevant behaviors has been studied—such as parenting style (Jeynes, 2007), family routine (Lanza & Taylor, 2010), parental aspirations (Spera, 2006),

parental cognitive stimulation (Simpkins et al., 2009), parental support (Melby, Conger, Fang, Wickrama, & Conger, 2008), parent-child communication (Easton, 2010), and parental monitoring (Annunziata, Hogue, Faw, & Liddle, 2006). While all these home involvement types could potentially reinforce learning, the nature of parental involvement changes and may be reduced for high school students due to several factors. In a qualitative case study that examined parental involvement and childrens' school achievement behaviors, parents reported feeling overwhelmed by the size of schools; they also felt that high schools are complex places where fewer parents interact with each other, as compared to elementary schools (Harris & Goodall, 2008). Other factors that might lead to changes in the nature of parental involvement include changes in school structure, presence of multiple teachers, parents' lack of efficacy in negotiating the complex system, and developmental changes in adolescents (Harris & Goodall, 2008; Hill & Tyson, 2009; Seyfried & Chung, 2002). The basic issue is not whether parental involvement is important; rather, it involves the type and degree of parental involvement (Pomerantz, Moorman, & Litwack, 2007).

When this concern is considered in tandem with previous research—research showing the importance of student age—there appears a preeminent need for more empirical research that would disentangle the different types of parenting behaviors and determine optimal fit between age and type of involvement.

Hill and Tyson (2009) propose what they call academic socialization and suggest that it "may entail communicating parental expectations for education and its value or utility, linking schoolwork to current events, fostering educational and occupational aspirations, discussing learning strategies with children, and making preparations and plans for the future" (Hill & Tyson, 2009). They contend that these behaviors help parents stay involved and meet the developmental needs of adolescents.

It was beyond the scope of this study to cover all the parenting involvement behaviors noted by Hill and Tyson (2009); accordingly, we focused on one variable proposed to be developmentally appropriate. We examined the construct of at-home parental support for learning as an important predictor of students' motivation in keeping with the notion, evident in previous research, which suggests subtle forms of at-home parental involvement may be more important than overt forms of parent school involvement (Epstein & Sanders, 2002; Jeynes, 2010). If at-home parental support for learning enhances student achievement motivation, it may offer parents and educators another avenue through which they can aid adolescents' academic success. Therefore, an important objective of this study was to determine the association of at-home parental support for learning with student-related outcomes, specifically students' personal goal orientations and persistence.

1.1 At-Home Parental Support for Learning

Parents' support of their children was found to relate to personal adjustment of children, intention to take more math courses, and other motivational benefits (Ethington, 1991; Grolnick, Kurowski, Dunlap, & Hevey, 2000; Malecki & Demaray, 2003). At-home parental support in the form of emotional support, instrumental support, informational support, and appraisal support was found to associate with personal adjustment for children (Malecki & Demaray, 2003). While the students' perception of parents as supportive did not sufficiently guarantee clear student-reported career goals, the lack of perceived parental support correlated directly with unreported career goals (Hill, Ramirez, & Dumka, 2003). Additionally, students who perceived parents as very unsupportive were more likely to perceive prevalent barriers to success (Hill et al., 2003).

Other researchers have studied parental autonomy support when referring to parental support (Pomerantz & Ruble, 1998). Parental autonomy support has its basis in self-determination theory, and has been defined as parental behaviors that promote choice versus parental controlling/pressuring behaviors (Grolnick et al., 2000; Grolnick, Ryan, & Deci, 1991). These parental supportive behaviors were found to relate to students' perceptions of control of their situation (internal control), feelings of competence, and better reading grades in the transition from middle to high school (Grolnick et al., 1991; Grolnick et al., 2000).

The varied operationalizations of at-home parental support for learning however has resulted in researchers finding variability in the relation of this variable with adaptive and maladaptive outcomes. Several researchers call for clear definitions and better measurement of parental constructs because of the confusion of construct operationalization and proliferation of varied constructs measured under the same label (Fan & Chen, 2001; Simpkins et al., 2009). The current study is a step in that direction as we delineate a particular aspect of parental support behavior—that is, at-home parental support for learning. Student perception of parental involvement is more important for academic success than actual parental involvement because parents might view their own behaviors more positively than their children do (Paulson, 1994); therefore, in the present study, student perceptions were used to assess at-home parental support for learning.

1.2 At-Home Parental Support for Learning and Student Motivation

Parents may positively benefit student achievement by increasing their motivation (Furrer & Skinner, 2003). Parent-child connections forged early on serve as a pathway by which parents can help their children's academic motivation (Furrer & Skinner, 2003). Among the different motivational frameworks for studying students' academic motivation, goal orientations are particularly important.

Goal orientation refers to the reasons a person engages in achievement-related behavior (Anderman, Austin, & Johnson, 2002). Understanding these reasons is critical because the kinds of goals students espouse predict student interest, self-esteem, efficacy, intrinsic motivation, and use of deep cognitive study strategies (Ames & Archer, 1988; Nolen, 1988; Harackiewicz, Barron, & Elliott, 1998; Linnenbrink & Pintrich, 2001; Middleton & Midgley, 1997; Elliott & Church, 1997; Skaalvik, 1997). Goal orientation is partly a cognitive approach to motivation, though it is partly a social approach because it takes into account the contextual factors that affect individuals (Kaplan & Maehr, 1999). Goal orientations have an idiosyncratic element to them, as different individuals have different goal orientations in a given situation, in part based on their own perceptions and in part based on environmental cues perceived in that given situation (Kaplan & Maehr, 1999). There are many factors that can be studied under the umbrella of contextual factors, including environmental (e.g. classroom, school), cultural (e.g. ethnicity), and social (e.g. the family and peer group) (Urdan, 1999).

Relatively less research has examined parental variables when compared to classroom goal orientations as predictors of the adoption of personal goal orientations (Chan & Chan, 2007; Kim, Schallert, & Kim, 2010). Gutman (2006) conducted a mixed methods study and found that parents who were more mastery oriented had children who were more likely to report mastery oriented goals themselves. Friedel, Cortina, Turner, and Midgley (2007) found that, for middle school students, parental goal orientations were stronger predictors of children's goal orientations than teacher goal orientations. Other researchers found positive links between parental mastery goal orientation and provided autonomy support during homework completion with student mastery goal orientation and academic efficacy (Gonida & Cortina, 2014; Gonida, Kiosseoglou, & Voulala, 2007; Gonida, Voulala, & Kiosseoglou, 2009). On the other hand, parental performance goal orientation, parental control, and parental interference were related to lowered mastery goals and reduced academic efficacy for students (Gonida & Cortina, 2014). Taken together, these findings suggest that students might adopt different goal orientations depending on the messages that they perceive from different parental actions.

1.3 Motivation Persistence Link

Generally, researchers indicate a motivation-persistence link (Allen, 1999). Most consider motivation the foundation on which persistence is built. Persistence then serves as a building block on which the tower of academic achievement is built (Martin, 2012). Motivation serves as an antecedent for achievement. As Appleton, Christenson, Kim, and Reschly (2006) say: "One can be motivated but not actively engage in a task. Motivation is thus necessary, but not sufficient for engagement." Motivation is the "antecedent cause," while persistence as a form of behavioral engagement is the "publicly observable behavior" (Reeve, 2012).

For the most part, persistence has been studied as an outcome variable embedded in behavioral engagement measures (Fredricks, Blumenfeld, & Paris, 2004). Persistence is malleable, and may be altered by task-related and personal-motivational determinants (Dweck & Leggett, 1988; Sideridis & Kaplan, 2011). Moreover, persistence has been reported to be important for school and post-secondary success (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006). In a study examining predictors of academic success, persistence was found to be a better predictor than temperament and character traits (Moreira et al., 2012). Anderman and Patrick (2012) examined the motivation-persistence link and used the goal orientation framework as their motivational lens. They conclude that research among different types of engagement and different forms of goal orientations is both important and needed (Anderman & Patrick, 2012).

Although earlier studies point to the links between motivational variables and academic persistence (Dweck & Leggett, 1988; Siderdis & Kaplan, 2011), there is less research on the associations between at-home parental support for learning, students' goal orientations, and mathematics persistence (Rowan-Kenyon, Swan, & Creager, 2012). Therefore, we decided to examine the antecedents of mathematics persistence by exploring its relation to parental and personal motivational variables. To our knowledge, no study has examined associations between at-home parental support for learning, students' achievement goal orientations, and mathematics persistence using a sample of students from the United States. Our study seeks to test this model with an American sample, focusing on the outcome of persistence in mathematics. Success in mathematics is important for students

because it expands their career options and it increases their prospects for high paying jobs (National Mathematics Advisory Panel, 2008). We therefore focused on the outcome of persistence in mathematics.

We hypothesized that adolescents' perception of at-home parental support for learning will lead to differences in their personal goals for math classes, subsequently influencing their mathematics persistence. A model informed by past theory and research was proposed for this study by linking together the literature that spanned research in parental involvement, goal orientations, and academic persistence (see Figure 1). The two research questions addressed in this study were: (1) What is the association between students' perceived at-home parental support for learning and students' personal achievement goal orientations? and (2) How well do student personal mastery and performance approach goal orientations predict persistence in mathematics?
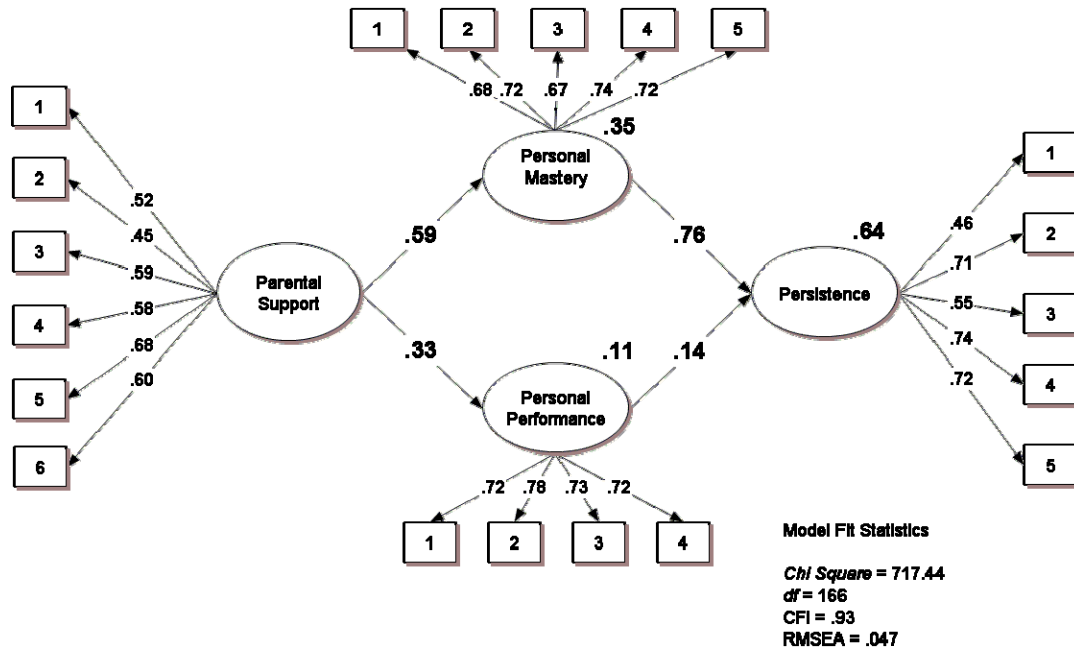

Figure 1. Hypothesized model of at-home parental support as a predictorof goal orientation and mathematics persistence via goal orientation

2. Method

2.1 Participants

Students from three ethnically-diverse high schools in a southeastern state in the United States were invited to participate in a survey early in the fall semester of 2010. The initial sample size was 1,534 ninth-grade students of various ethnicities: 53.6% White, 20.2% African American, 9.2% Hispanic/Latino, 3.6% Asian/Pacific Islander, 0.5% American Indian, and 6.8% Other. Gender distribution was as follows: 40% of the sample was male, 37.5% of the sample was female, and 22.5% of the sample did not indicate gender. The age of participants ranged from 13 to 18 years with 94.4% of the sample being either 14 or 15 years of age at the time of the survey. A total of 25 students had missing responses on 90% of the variables. After deleting cases with more than 90% missing responses, 95% of the students had 15 or fewer missing responses and the sample size was reduced to 1,509 students.

2.2 Procedure

Four measures were embedded in a larger questionnaire administered to ninth-grade students in mathematics classrooms from three large high schools: at-home parental support for learning, personal mastery goal orientation, personal performance approach goal orientation, and mathematics persistence. Questions for these four measures were randomly presented in distinct sections of the questionnaire due to disparate response formats. Students were asked to think about their parents (or primary caregivers) when responding to items referring to parents. For the remaining questions, students were requested to respond in terms of their current

math class. Depending on access granted for entry, students were either administered surveys in a large group (in the cafeteria), in their homeroom class, or in their English class. The survey took about 20 minutes to complete.

2.3 Measures

2.3.1 At-Home Parental Support for Learning

The focus of the present study was on a specific aspect of parental support, namely students' perceptions of at-home parental support for learning. Since no measure was found that examined this aspect of the parental support construct for high school students, items were borrowed from a measure developed by Marjoribanks and Mboya (2000). Their measure consisted of 19 items covering three different constructs: students' perceptions of what their parents do at home to support their learning, parental expectations, and parenting style. Six items identified as the best content representation of at-home parental support for learning. A sample item reads: "My parents encourage me to complete my schoolwork". Responses ranged from 1 (*strongly disagree)* to 5 (*strongly agree)*. The mean score across items was 3.53 (*SD*=0.82). Higher scores reflect higher levels of students' perceptions of at-home parental support for learning (ω=.75, Bootstrap corrected [BC] 95% CI [.72, .77]).

2.3.2 Personal Mastery Goal Orientation

This measure of student personal mastery goal orientation was taken from the Patterns of Adaptive Learning Survey (PALS: Midgley et al., 2000). This measure consisted of five items that measure the extent to which students believe that their focus is on learning and understanding in their classroom. Sample item: "One of my goals in class is to learn as much as I can." Item responses ranged from 1 (*not at all true of me*) to 5 (*very true of me*). The mean score across items was 3.86 (*SD*=0.86). Higher scores reflect higher levels of personal mastery goal orientation (ω=.83, BC 95% CI [.82, .85]).

2.3.3 Personal Performance Approach Goal Orientation

This measure of student personal performance approach goal orientation was taken from the Patterns of Adaptive Learning Survey (PALS: Midgley et al., 2000). This measure consisted of four items that measure the extent to which students' goals focus on demonstrating that they are better than other students. Sample item: "One of my goals is to look smart in comparison to the other students in my class." Item responses ranged from 1 (*not at all true of me*) to 5 (*very true of me*). The mean score across items was 2.95 (*SD*=1.05). Higher scores reflect higher levels of personal performance approach goal orientation (ω=.83, BC 95% CI [.81, .84]).

2.3.4 Persistence in Mathematics

This measure consisted of five items from a much longer measure of student engagement originally developed by Wellborn and Connell (as cited in Miserandino, 1996). A sample item reads: "If a problem is really hard, I keep working at it". Responses ranged from 1 (*not at all true of me)* to 5 (*very true of me)*. The mean score across items was 3.50 (*SD*=0.84). Higher scores reflect higher levels of persistence in mathematics (ω=.83, BC 95% CI [.75, .79]).

2.4 Data Analyses

Prior to testing the research questions, the dimensionality of the measures used in this sample were evaluated. Since there were missing values in the cases, multiple imputation was conducted to handle any missing data. Multiple imputation is better than traditional techniques (e.g. listwise deletion) for handling missing data because it produces good parameter estimates in the presence of missing data (Graham, 2003; Schafer & Graham, 2002). Recent research on the optimal number of datasets for multiple imputation suggests that, to increase statistical power, the number of imputed datasets should be high (Graham, 2009). For 15% item-level missing data, as is the case in the present analysis, 20 imputations was considered to be adequate (Graham, Olchowski, & Gilreath, 2007).

All analyses reported in this study were conducted within M*plus* version 6.0 (Muthén & Muthén, 1998-2010). Exploratory factor analysis (EFA) was used to explore the dimensionality of items on each of the adapted measures: at-home parental support for learning and persistence in mathematics. Several criteria were used for determining the number of factors to retain: eigenvalue greater than 1 rule (Kaiser criterion), parallel factor analysis, a visual inspection of Cattell's scree plot, theoretical expectations, and interpretability. The personal mastery goal orientation and personal performance approach goal orientation scales have been widely used, and are reported to have adequate reliability estimates using samples similar to ours (Midgley & Urdan, 2001). Therefore, each measure was subjected to a confirmatory factor analysis (CFA). The CFAs were performed on imputed datasets using the MLM estimation method (also known as Satorra-Bentler S-B χ^2 statistic). Since

M*plus* does not provide modification indices for CFAs when data consists of multiple imputed datasets, CFAs were conducted on the original dataset (with missing data) to get modification indices to determine model-data fit.

Finally, a full structural equation model (SEM) analysis was conducted to test a model in which at-home parental support for learning was hypothesized to predict student personal goal orientations which, in turn, predicts persistence in mathematics. The SEM analyses addressed the two questions posed in this study: 1) What is the association between students' perceived at-home parental support for learning and students' personal achievement goal orientations? and (2) How well do student personal mastery and performance approach goal orientations predict persistence in mathematics?

To compare differences in paths, 95% confidence intervals were computed using unique error terms that assumed a standard normal distribution. Confidence intervals were computed using unstandardized coefficients and corresponding standard errors.

Model goodness of fit was evaluated on the basis of several fit statistics. Traditionally, χ^2 has been the statistic of choice (Davey, Savla, & Luo, 2005). Given problems with only using χ^2, fit was assessed using additional indices, including root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), and the comparative fit index (CFI) (Brown, 2006). The following cut-offs were used for determining good model fit: RMSEA ≤ .05 (Yu, 2002), SRMR ≤ .07 (Yu, 2002), and CFI > .90 (Kline, 2005).

3. Results

3.1 Preliminary Analyses

Means, standard deviations, and zero-order correlations for all study variables are shown in Table 1. Results from the EFAs using principal axis factor extraction suggested a one-factor solution best explained the relation among items on both the at-home parental support for learning scale and persistence in math scale. This was based on only one eigen value greater than one, consistently high factor loadings for a one-factor solution, the subjective screeplot, and parallel factor analysis all suggesting only one factor be retained.

Table 1. Sample means, standard deviations, and zero-order correlations for study variables

Measure	1	2	3	4
1. Parental support	__			
2. Personal mastery goals	.44**	__		
3. Personal performance goals	.25**	.28**	__	
4. Mathematics Persistence	.41**	.63**	.31**	__
M	3.53	3.86	2.95	3.50
SD	.82	.86	1.05	.84

Note. ** *p* < .01.

The CFA results indicated a reasonably good-fitting model for the 2-factor personal goal orientations model (i.e. person mastery and personal performance approach goal orientations) using the imputed datasets, S-Bχ^2(26, *N*=1,509)=176.19, RMSEA=.06, CFI=.96, and SRMR=.04.

3.2 Full SEM Analysis

Results from the full SEM analysis indicated the hypothesized model in Figure 1 had a good fit to the sample data. All path coefficients were significant and positive, with the largest path coefficients occurring for parental support onto parental mastery and parental mastery onto persistence in mathematics. Furthermore, the path coefficient from at-home parental support for learning to personal mastery was significantly different from the path coefficient for at-home parental support for learning to personal performance goals because the 95% confidence intervals did not overlap (see Table 2). Overall, at-home parental support, students' personal mastery and performance goal orientations explained 64% of the variance in mathematics persistence.

Table 2. 95% Confidence Intervals (CIs) for unstandardized path coefficients

Paths	95% CIs
Personal mastery on parental support	[0.54, 0.64]
Personal performance on parental support	[0.27, 0.39]
Persistence on personal mastery	[0.72, 0.80]
Persistence on personal performance	[0.09, 0.18]

Note. 95% CIs are statistically significant if they do not capture the null value of 0.

4. Discussion

Theoretical and empirical researchers have suggested the importance of contextual variables, particularly classroom goal orientation, in influencing the goal orientations adopted by students. Some researchers have argued that parental involvement may be beneficial not only for elementary age students but also adolescents (Hill & Tyson, 2009); however, few research studies have included parental variables as possible contextual precursors to students' personal goal orientations (Friedel et al., 2007; Gutman, 2006). Moreover researchers have reasoned that parental home involvement may be more important for adolescents than parental school involvement (Jeynes, 2007, 2010). Based on all these findings this study extends the research on parental involvement to include at-home parental support for learning.

Additionally, this study contributes to the existing research on the role of parental involvement for student motivation and persistence in several ways. An important finding is that students perceived at-home parental support for learning was more strongly related with students' personal mastery goal orientations than students' personal performance goal orientation. In other words, when students perceived at-home parental support for learning, they were more likely to endorse personal mastery goal orientations themselves. These findings are consistent with prior research where parental supportive behaviors were found to be related with beneficial student outcomes such as students' perceptions of internal control, competence, and personal adjustment for students (Grolnick et al., 1991; Grolnick et al., 2000; Malecki & Demaray, 2003). There is some evidence to suggest that student report of competence relates with student mastery and performance goal orientation. Dweck and Leggett (1988) state that the focus of mastery goal oriented individual is on "increasing one's competence" whereas a performance goal oriented individual is "concerned with gaining favorable judgments of their competence." (p. 256) Thus both mastery focused and performance focused students may espouse competence however there is a subtle distinction in the way that competence is perceived. Interestingly, perceiving at-home parental support for learning was also associated with students' performance goal orientation. It appears that at-home parental support might be construed by students in mastery and performance terms. One possible explanation is that at-home parental support behaviors might be perceived by students as couched in either mastery or performance goal orientation terms. This is only a speculation and testing this hypothesis was beyond the scope of the current study; however, it is a topic worthy of further investigation.

The notion that parental involvement is important for student related outcomes is not new, though this study highlights the need for addressing the role of at-home parental support for learning when considering adolescent student academic outcomes. At-home parental support for learning is worthy of study for the practical reason that behaviors amenable to interventions—as opposed to variables such as socio-economic status—offer more potential for real-life applications in achieving improved academic success for the typical student. Furthermore, as previous studies suggest, subtle forms of parental home involvement become more prevalent than overt forms of parent school involvement for adolescent students. An emphasis on the potentially influential at-home parental support for learning is, therefore, a promising area of research that will guide parents and administrators about ways in which they can aid adolescents' academic success.

It is not surprising that the students' personal mastery goal orientation was more strongly related with students' mathematics persistence. These findings are consistent with previous research where personal mastery goal orientation was found to be significantly and positively related with persistence (Dweck & Leggett, 1988; Sideridis & Kaplan, 2011). Additionally, the finding that students' performance goal orientation was positively related with students' mathematics persistence is also consistent with prior research. Researchers have reported the association of personal performance goals with adaptive outcomes (Elliot & Church, 1997; Skaalvik, 1997; Sideridis & Kaplan, 2011). Although the association between personal performance goals and persistence was

significant and positive, the path coefficients suggested that the correlation of personal mastery goals with persistence was stronger. This finding has been corroborated by past research that indicates the adoption of personal mastery goal orientation as more advantageous over the adoption of personal performance goals (Kaplan & Middleton, 2002; Midgley, Kaplan, & Middleton, 2001). Educators interested in increasing student persistence might want to create a classroom environment that is mastery oriented. Given that previous research documents the importance of classrooms as important contextual variables related to personal goal orientations (Meece, Anderman, & Anderman, 2006). Thus, student perception of classroom mastery will relate to personal mastery, which in the present study and previous studies has been found to be associated with student persistence.

4.1 Limitations of the Present Study

One limitation of the present study is the use of student self-report surveys. As pointed out by Henderson and Mapp (2002), student self-report surveys are limited to perceptions and fail to take the objective reality of complex parent-child interactions into consideration. It could be that students' perceptions of at-home parental support for learning differed from actual parental support; therefore, one cannot say for certain that parents actually provided at-home support for learning. Given our interest in examining students' persistence with perceived at-home parental support and personal motivation, we collected student self-report data. It will be worthwhile to examine these constructs by taking students' perceptions into account and by using teacher report and observational data. Additionally, in this study, students' perceptions about their goal orientations and persistence were collected in the context of their math class. Future researchers might want to examine the role of at-home parental support for outcomes at a global level, rather than in the context of mathematics class only.

An additional limitation of the present study is that the dynamic relation between all the variables studied could not be fully explored, given that the data were collected at the beginning of the fall semester of ninth grade. Future research is needed to determine if the nature of at-home parental support for learning changes as a result of exposure to differing levels of the high school experience as well as developmental changes within the adolescent student. Not surprisingly, researchers have found that the nature of effective parental involvement changes with students' age. For example, at the eighth grade level, high parental expectations were found to most strongly predict types of coursework completed in high school; however, for twelfth grade students, helping students make choices by advising and guiding academic decisions was found to be more important (Catsambis, 2001). Similarly Muller (1998) found that certain parental behaviors—such as restricting activities with friends and limiting TV viewing time—related to eighth grade students' achievement but not twelfth grade students. Thus, consideration of at-home parental support for learning, academic goal orientations, and academic persistence at different points throughout high school will provide a better picture of how and if at-home parental support continues to predict student persistence. It could be that at-home parental support is more influential at the beginning of high school. Drawing any conclusions about the unique and continuous contribution of at-home parental support for student persistence through high school is beyond the scope of the present study and merits further investigation.

4.2 Implications for Practice, Application, and Policy

Taken together, these findings have implications for researchers, teachers, administrators, and parents, as well as students. The findings of the present study suggest that students' perceptions of at-home parental support are associated with their personal goal orientations and mathematics persistence. In light of these findings, including at-home parental support variables in models that examine student persistence would be appropriate and desirable.

Additionally given the strong positive correlation of students personal mastery goal orientation with students' academic persistence for mathematics, teachers and parents who wish to encourage student persistence might create more mastery oriented environments. This suggestion might be somewhat counterintuitive to perceived high school environments where being competitive is necessary in preparation for SAT/ACT exams. Past research, however, strongly supports this finding and, thus, creation of a mastery-oriented environment is desirable.

The results of the current study also provide some suggestions for parenting practices. Specifically, by encouraging students to study, expressing interest in students' schoolwork, and encouraging completion of schoolwork, parents may support student motivation. Parents might be cautious in the way that this support is conveyed however. This is because if the support is interpreted by the student as a message for outperforming other students, it might lead to the development of performance goal orientation. Given the advantages of

adopting mastery goal orientation over personal performance goal orientation, parental support conveyed in mastery-oriented terms might be more beneficial.

Schools, teachers, and administrators may also provide this information to parents as a way to increase student motivation and persistence. It might be important to encourage parental support as provided in ways that encourages learning and understanding, not as a desire to outperform others or demonstrate that the student is better than other students. This is because students may pick up on these messages and become mastery or performance oriented, depending on the message conveyed and perceived. To conclude, these findings suggest that at-home parental support for learning is associated with students' academic motivation and persistence in the classroom. Higher levels of persistence may or may not immediately lead to higher achievement, but they are a worthy goal in themselves.

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