ORIGINAL PAPER

Parenting behaviors and learning of Singapore students: The mediational role of achievement goals

Wenshu Luo · Khin Maung Aye · David Hogan · Berinderjeet Kaur · Melvin Chee Yeen Chan

Abstract This study examined the mediational role of achievement goals between parental behaviors and learning outcomes. A sample of 1667 Singapore Secondary 3 students took the measures of parental involvement in learning, parental control, mastery approach and avoidance goals, performance approach and avoidance goals, as well as seven learning outcome variables in their math study. We conducted complex structural equation modeling analysis to take into account the hierarchical structure of the data and found a good fit for the hypothesized partial mediation model. More specifically, parental involvement in learning was associated with an adaptive learning profile (i.e., self-regulated engagement in learning activities, low anxiety, high perceived competence, and high achievement), partially or mainly through its positive relationship with mastery approach goals. Parental control predicted a maladaptive coping orientation (i.e., low persistence and high anxiety) and low achievement partially through its positive relationship with mastery and performance avoidance goals. The findings are discussed in the academic context of Singapore.

Keywords Parental behaviors · Achievement goals · Learning

W. Luo · K. M. Aye · D. Hogan · B. Kaur · M. C. Y. Chan
Nanyang Technological University, Singapore, Singapore

W. Luo (✉)
Centre for Research in Pedagogy and Practice, National Institute of Education, 1 Nanyang Walk, Singapore 637616, Singapore
e-mail: wenshu.luo@nie.edu.sg

Introduction

Achievement goal theory has been one of the most prominent frameworks to understand students' achievement motivation and learning profiles over the past 30 years. From a social cognitive perspective, achievement goal researchers argue that achievement goals are important lens to understand how environmental characteristics affect students' motivation and learning. This argument is largely supported by studies on achievement goals and school and classroom environment (Ames 1992; Kaplan et al. 2002; Luo et al. 2011a; Maehr and Midgley 1991; Meece et al. 2006). However, the influences of parenting practices on students' goal orientations are only recently examined (Duchesne and Ratelle 2010; Friedel et al. 2007; Kim et al. 2010). In this study we investigated the mediational role of achievement goals between parenting behaviors and students' learning. This study adds to the limited literature on the relation between parenting practices and achievement goals, especially the four types of goals defined by the 2 × 2 achievement goal framework (Elliot and McGregor 2001; Pintrich 2000). It also provides a link between research on the relationship of parenting behaviors to achievement goals and achievement goals to learning outcomes. In addition, with Singapore secondary students as participants, this study expands research on parenting, achievement goals, and learning to a non-Western context.

Achievement goals and learning

Early research on achievement goals distinguished between mastery goals, which focus on learning and understanding, and performance goals, which focus on ability and performance relative to others (e.g., Dweck and Leggett 1988; Nicholls 1984). Although the positive link between

mastery goals and academic performance has not been consistently found, the generally positive learning patterns associated with mastery goals are reported in most studies (Ames 1992; Meece et al. 2006). While some studies found that performance goals were associated with maladaptive learning patterns, such as anxiety, help-seeking avoidance, and self-handicapping tactics (Midgley et al. 2001; Ryan and Pintrich 1997), other studies reported that performance goals could also be facilitative to learning. For example, positive relations were found between performance goals and task values, graded performance, and academic self-concept (Bong 2001; Harackiewicz et al. 2000; Pajares et al. 2000).

To explain the inconsistent findings about performance goals, recently researchers distinguished between two types of performance goals (Elliot and Church 1997; Elliot and Harackiewicz 1996), performance approach goals that focus on the demonstration of competence relative to others, and performance avoidance goals that focus on avoiding unfavorable judgments of ability or competence. Performance avoidance goals have been found to be associated with low efficacy, high anxiety, self-handicapping strategies, and low grades (Urdan et al. 2002). Pure performance approach goal orientation is generally adaptive. For example, compared with performance avoidance goals, it has been positively related to grades, competence beliefs, engagement, and use of learning strategies (Elliot and Church 1997; Elliot and McGregor 2001; Lau and Nie 2008; Liem et al. 2008). However, researchers have also suggested that performance approach goals are likely to transform to performance avoidance goals when students are in the face of difficulties or the likelihood of failure (Luo et al. 2011b; Middleton et al. 2004).

More recently, the approach and avoidance distinction has also been made for mastery goals (Elliot and McGregor 2001; Pintrich 2000). Individuals approaching an activity with mastery approach goals make efforts to improve and develop their knowledge and skills, while students approaching an activity with mastery avoidance goals are concerned about misunderstanding and failing to learn well. A few studies measured mastery-avoidance goals and found that this dimension was positively related to anxiety (Elliot and McGregor 2001) and help-seeking threat (Karabenick 2003), negatively associated with intrinsic motivation and perceived competence (Cury et al. 2006; Van Yperen 2006), and not related to performance (Elliot and Murayama 2008; Yeo et al. 2009). Based on these findings, mastery avoidance goals were generally maladaptive. However, to improve our understanding of mastery avoidance goals, more studies are still needed to examine how this dimension is empirically different from the other three dimensions of achievement goals.

Parental behaviors and learning

Parents play a prominent role in shaping children's development, including school related outcomes. Building on previous work on parenting practice, Grolnick and Ryan (1989) found that parental autonomy support or control and parental involvement are two important dimensions for predicting children's self-reports of autonomous self-regulation, teacher-rated competence and adjustment, as well as school grades and achievement. Parental involvement was conceptualized as the degree to which parents are interested in, knowledgeable about, and take an active part in the child's life. Parental autonomy support or control was defined as the extent to which parents value and encourage children's independent problem solving, choice, and participation in decisions, rather than coerce their children to conform to their expectations through punitive disciplinary practices.

From a self-determination perspective, empirical studies have shown that perceived parental involvement and psychological autonomy support were associated with students' learning and well-being. For example, Chirkov and Ryan (2001) reported that in both the United States and Russia, high school students' perceived parental autonomy support predicted internal or autonomous regulation in their academic work and psychological well-being. In addition, some studies reported that motivation functioned as a mediator between parenting practices and learning outcomes. For example, Grolnick et al. (1991) examined a process model between 3rd and 6th graders' perceptions of these two dimensions of parenting practices, their motivation and their performance in school. They found that the two maternal parenting variables were positively associated with students' perceived competence, control and autonomy and in turn these three motivational variables were related to children's performance. d'Ailly (2003) reported that both maternal autonomy support and involvement predict children's perception of autonomy and control in Taiwan, and the perceived control positively predicted diligence and academic achievement. In their study to examine whether autonomy is valued in Eastern cultures, Vansteenkiste et al. (2005) reported that parental autonomy support predicted adaptive learning strategies and well-being of Chinese studies, and these effects were completely mediated by students' perceived autonomy for studying.

Although achievement goals are important motivational factors for understanding engagement and learning, the influences of parenting practices on students' achievement goals are only recently examined. In general, these studies reported that parental involvement and autonomy support were associated with mastery goals, while parental control was related to performance goals. For example,

Gonzalez et al. (2002) studied the relationship between perceived parenting practices and mastery and performance approach goals of high school students. They found that parent involvement (i.e., helping with homework, attending school programs, attending extracurricular programs, helping select courses, and knowledge of school progress) was positively correlated with mastery goal orientation. Maternal authoritativeness (autonomy and explanations of rules) was related to mastery goal orientation, while maternal authoritarianism (rules and forced obedience and compliance) and permissiveness (little control and assistance) were related to performance goal orientation. Duchesne and Ratelle (2010) reported that parental involvement in daily lives predicted mastery goals of adolescents, whereas parental control predicted performance goals, and the latter was mediated by symptoms of anxiety. Gurland and Grolnick (2005) also reported that controlling parenting was related to performance goal orientations, while parental autonomy support was related to mastery goal orientations.

Very limited research has examined the mediational role of achievement goals between parenting and learning. Some exceptions can be found with studies that investigated the effect of parental goal emphasis on achievement goals and learning. For example, Friedel et al. (2007) reported that seventh graders' mastery and performance approach goals mediated the relations between perceived parent and teacher achievement goal emphases and children's efficacy beliefs and coping strategies. Similarly, Gonida et al. (2009) found that mastery goal orientation mediated the relationship of school mastery goal structure and parent mastery goal emphasis to students' behavioral and emotional engagement in their learning. Boon (2007) reported both parental involvement and strictness/supervision were positively correlated with mastery goals and self-efficacy, and negatively correlated with self-handicapping and the three student variables mediated the relationship between parenting practices and achievement. At least to our knowledge, no study has examined the mediational role of all the four types of achievement goals based on the 2×2 achievement goal framework in the relationship between parenting behaviors and learning outcomes.

Significance and hypotheses of the present study

This study was designed to examine the mediational role of achievement goals between parenting and learning outcomes of Singapore secondary students in their math study. In addition to the four types of achievement goals based on the 2×2 achievement goal framework, we measured two parenting dimensions—parental involvement in learning and parental control, seven learning outcome variables—classroom engagement, homework engagement,

meta-cognitive self-regulation, effort regulation, math self-concept, math anxiety, and math achievement, as well as two covariates—gender and previous math achievement. It should be noted that in this study we measured parental involvement in students' learning activities, rather than general parental care or warmth. This is because learning is the main task of secondary students and we believe that parental involvement in children' learning should have more immediate influence on students' achievement motivation and learning than general parental warmth or care.

This study expands research on parenting, achievement goals, and learning to Singapore, a modernized Confucian country. It is well known that in the Confucian culture, parents, teachers, and students all recognize the importance of effort and academic achievement (Hau and Salili 1991; Salili 1996). The cultural emphasis on effort exertion has pressured Chinese children to study for long hours (Salili et al. 2001), and this might be one of the reasons why students from Asian countries, such as Singapore, achieved high scores on international assessment but also reported high anxiety and low confidence (Lee 2009). In addition, the education environment in Singapore is very competitive, even in primary schools. In a small country with few natural resources, educational success is very important for the future success of individuals as well as the nation (Liem et al. 2008; Luo et al. 2011b). Therefore, it is particularly interesting and meaningful to examine how achievement goals relate to parenting practices and its role between parenting and learning.

Based on the literature, we test the hypothesized mediation model as described below. In terms of the relationship between parenting behaviors and achievement goals, in accordance with the general findings in the literature, we expected that parental involvement in learning would predict positively mastery approach goals and parental control would predict positively performance approach and avoidance goals (Duchesne and Ratelle 2010; Gonzalez et al. 2002; Gurland and Grolnick 2005). Since in this study we measured parental involvement in children's learning, rather than general parental warmth or care, we expected that this dimension would also predict positively students' performance approach and avoidance goals. This is because by involving in children's learning activities, parents might also convey the message that they care about the performance of their children relative to others, and this might be particularly true in the very competitive academic context of Singapore. In addition, we hypothesized that parental control would predict positively mastery avoidance goals. Controlling parents might coerce their children to meet their expectations (Duchesne and Ratelle 2010) and thus provoke the tendency of their children to avoid not doing their best in their study.

In terms of the relationship between achievement goals and learning outcomes, based on previous research findings, we hypothesized that mastery approach goals predicted all the seven learning outcome variables in an adaptive way, and mastery avoidance goals would predict positively math anxiety, and negatively effort regulation and math self-concept. In addition, based on the general findings in previous studies (Elliot and Church 1997; Lau and Nie 2008; Liem et al. 2008; Luo et al. 2011b; Midgley et al. 2001; Urdan et al. 2002), we expected that performance avoidance goals would have a negative effect on learning while performance approach goals would have a generally positive effect on learning after performance avoidance goals are controlled. More specifically, we hypothesized that performance avoidance goals would predict positively math anxiety and negatively math achievement and effort regulation, while performance approach goals would predict positively classroom engagement, homework engagement, meta-cognitive self-regulation and math self-concept. Although some studies (Barron and Harackiewicz 2001; Harackiewicz et al. 1997, 2000) also reported positive relationship between performance approach goals and performance, these findings were mainly reported for college students (Gonida et al. 2009; Midgley et al. 2001). In addition, previous studies including our own (Elliot and Murayama 2008; Luo et al. 2011a, b) often reported a moderate or high correlation between performance approach and avoidance goals, thus we predicted that after controlling for performance avoidance goals, performance approach goals would not predict achievement in this study.

We expected that in general parental involvement in learning would be associated with a positive learning profile, while parental control would be detrimental to learning. In addition, the mediational role of achievement goals would explain at least part of the relationship between parenting and learning, even after controlling for previous achievement and gender.

Method

Participants and procedure

This study was part of a large-scale research project that examined classroom practices in Singapore schools and how these practices affect students' learning. Schools were divided into three strata based on their prior aggregate school achievement and 10 schools were randomly selected from each stratum. Within each school, half of the Secondary 3 classes and within each class half of the students were invited to participate in this study (Secondary class size is about 35–40 in Singapore. The other students were

asked to take other measures of this project). Participants in the same class were group administered an online survey first and then an online math assessment in their computer laboratories with an interval of 1–3 weeks. The average time for both the survey and assessment was about 40 min. There were 1667 students who took both the survey and assessment and 182 students who did not take the math assessment after the survey. t test showed that they were not significantly different in their math scores in Primary School Leaving Examination (t (1847) = .193, p = .85) and the 182 cases were deleted in this study. The 1667 students were from 113 classes of 30 schools (average number of students per class = 14.75) and they included 879 (52.7 %) boys and 788 (47.3 %) girls, with an average age of 14.93 (SD = .59). Ethnic composition was Chinese (1222, 73.3 %), Malay (244, 14.6 %), Indian (118, 7.1 %), and others (83, 5.0 %).

Measures

Achievement goals

The approach and avoidance components of mastery and performance goals in learning mathematics were measured in this study. The scales employed to measure mastery approach goals (3 items), performance approach goals (3 items), and performance avoidance goals (3 items) were adapted from the Patterns of Adaptive Learning Scale (Midgley et al. 1998; Midgley et al. 2000). Since this instrument doesn't include a scale to measure mastery avoidance goals, we assessed this dimension (3 items) using items adapted from the Achievement Goal Questionnaire (Elliot and McGregor 2001). Mastery approach goals refer to students' orientations to learn new things and challenging ideas. Sample items include, "An important reason I do my math work is that I like to learn new things," and "I like the work in my math class best when it challenges me to think." Mastery avoidance goals refer to a striving to avoid misunderstanding or failing to learn course material. Sample items are, "I'm worried that I am not trying my best in my math lessons," and "I'm afraid that I may not understand the content of my math class thoroughly." The performance approach goals scale assesses students' desire to demonstrate high performance to teachers and students in their math class, such as "I want to show my classmates in my math class that I am smart," and "I like to show my teacher that I am smarter than my classmates in my math class," The performance avoidance goals scale taps students' orientations to avoid appearing incompetent in math in front of their classmates and teachers, such as "I do my math work because I do not want the teacher to think that I am stupid," and "It is important that my classmates in my math class do not think

I am stupid." The response categories of the four scales ranged from 1 (strongly disagree) to 5 (strongly agree). The internal consistency reliabilities for mastery approach, mastery avoidance, performance approach, and performance avoidance goals were .85, .80, .85, and .81, respectively.

Parenting behaviors

Two types of parental behaviors were measured in this study: parental involvement in learning and parental control. Parental involvement in learning refers to the extent to which our participants perceive their parents as responsive, supportive, and involved in their learning. Based on existing measures in the literature (Gonzalez et al. 2002; Steinberg et al. 1992), four items were designed to measure parental involvement in learning: "My parents are willing to help me with my school work," "I often discuss my homework with my parents," "My parents encourage me to participate in co-curricular activities," and "I often have discussions about major world events with my parents." Following Steinberg (Steinberg et al. 1991, 1992), the parental control scale (four items) measures the extent to which parents employ coercive discipline with their children. They are, "My parents say that I shouldn't argue with adults," "My parents tell me that their ideas are correct and that I should not question them," "My parents don't let me make my own plans for things I want to do," and "My parents won't agree with me if I suggest doing something they don't like." Both parental dimensions were rated on a five-point scale. The internal reliabilities were .77 and .74, respectively, for parental involvement in learning and parental control.

Learning outcomes

In addition to achievement goals, seven learning-related variables were measured in this study: classroom engagement, homework engagement, meta-cognitive self-regulation, effort regulation, math self-concept, math anxiety, and math achievement.

The first six variables were measured by using self-reported scales. Adapted from the Rochester Assessment Package for School-Students Report (Wellborn and Connell 1987), the class engagement scale (3 items) measures the extent to which students pay attention to activities during their math class, such as "In my math class, I listen carefully when the teacher explains something." The 4-item homework engagement scale (adapted from VanDamme et al. 2002) measures the extent to which students treat their homework seriously and put effort in doing their homework, such as "I put much effort in my math homework." The meta-cognitive self-regulation scale

(6 items), adapted from the Meta-cognitive Awareness Inventory (Schraw and Dennison 1994), taps the degree to which students use planning, monitoring, and correcting activities in their study of math. Sample items are, "I think about what I really need to learn before I begin a task," and "I ask myself how well I am doing while I am learning something new." Adapted from Pintrich et al. (1993), the effort regulation scale (3 items) measures how well students controlled their effort and attention in the face of difficult and boring tasks in math, such as "When the work in math is difficult, I give up." The items were reversely coded to obtain scores on effort regulation. The scale of math self-concept adapted from the Program for International Student Assessment (PISA 2003) measures students' perception of how good they are in learning math, such as "I have always believed that math is one of my best subjects." In addition, four items adapted from PISA (2003) were used to measure students' experienced anxiety in learning math, such as, "I get very nervous answering math questions."

All the six variables were rated on a 5-point Likert-type scale. The internal consistency reliabilities were .87, .88, .86, .77, .89, and .83, respectively, for class engagement, homework engagement, meta-cognitive self-regulation, effort regulation, math self-concept, and math anxiety.

To measure math achievement of a large number of Secondary 3 students, an online multiple-choice test was constructed by a small group of experienced teachers and researchers with reference to the curriculum. The test included questions assessing students' knowing, applying, and reasoning abilities in four mathematics content areas, including Number, Algebra, Measurement and Geometry, as well as Statistics and Probability. Through pilot testing and item analysis, 28 items with good psychometric qualities that represented the proposed content and cognitive domains were selected to measure math achievement in this study. In addition to the current math achievement measured by this test, students were also asked to report their Primary Leaving School Examination (PSLE) scores in math taken 3 years earlier. The PSLE math scores ranged from 1 to 7, with higher scores indicating higher performance. As evidence of convergent validity of the current math achievement test, students' scores on it and on PSLE math were correlated at .31.

Results

We used structural equation modeling (SEM) approach to test the mediation model of achievement goals based on the latent variables. Before the mediation model was tested, we conducted three types of analyses to have a preliminary understanding of the data. First, we examined the

zero-order correlations among all the variables, including the two covariates, gender and previous math achievement (PSLE math scores). Due to the relatively large sample size in the present study, .01 was used as the criterion of statistical significance. As shown in Table 1, gender had low correlations with some of the parenting, achievement goals, and learning variables. In line with previous studies (Duchesne and Ratelle 2010; Grolnick and Ryan 1989), girls perceived their parents to be slightly less controlling. Girls were more likely to endorse mastery avoidance goals, and less likely to have performance approach and avoidance goals. This is generally consistent with previous research (e.g., Duchesne and Ratelle 2010; Elliot and Church1997; Luo et al. 2011b) that found girls tended to be mastery-oriented and boys tended to be performance-oriented. In addition, previous math achievement was also correlated with performance approach and avoidance goals and both gender and previous math achievement were related to some learning outcome variables. Therefore, the two covariates should be controlled in order to examine the mediation model of achievement goals.

Second, we decomposed the variances of each variable across the three levels, student, class and school. It can be seen from Table 2 that except for current and previous math achievement all the other variables showed very little variance at school level (0–2 %). In addition, only three of the fourteen variables—math self-concept, current math achievement and previous math achievement, had a total variance at class and school levels larger than 10 %. In consideration of (1) the relatively small variances at class and school levels in most of the variables, especially all the parenting and achievement goal variables and (2) the complexity of the mediation model and the large number of parameters to be estimated (15 variables and 50 indicators) relative to the number of units at class (113) and school level (30), we focused our mediational analysis at student level for simplicity purpose. However, we also think that it is necessary to take into account the variances across classes and schools in some of the learning variables in order to have more accurate standard errors (Krull and MacKinnon 2001). Therefore, we conducted complex SEM analysis by setting TYPE = COMPLEX and CLUSTER = Class (due to the nested structure of the data, the class level variance in the two level complex analysis includes the variance from both classes and schools) in Mplus 5.2 to test the mediation model at student level. In addition, the Maximum Likelihood Robust method was used to produce parameter estimates with standard errors and χ^2 test statistic that are robust to non-normality and non-independence of observations (Muthén and Muthén 2010).

Third, before the full mediation model was tested, a confirmatory factor analysis was conducted to test the

Table 1 Descriptive statistics and correlations among gender, previous math achievement, parenting, achievement goals, and learning

	M	SD	Range	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Gender	1.47	.50	1–2	–	–.03	–.04	–.07*	–.01	.12*	–.14*	–.11*	.05	.10*	–.02	.08*	–.11*	.02	.08*
2. Previous math achievement	4.83	1.59	1–7		–	–.03	–.03	.04	.00	–.07*	–.08*	.03	.05	.00	.09*	.11*	–.08*	.31*
3. Parental involvement in learning	3.18	.83	1–5			–	–.06	.26*	.01	.13*	.07*	.25*	.27*	.31*	.06	.19*	–.05	.07
4. Parental control	3.14	.86	1–5				–	.03	.12*	.17*	.20*	–.02	–.00	.06	–.20*	–.02	.16*	–.11*
5. Mastery approach goals	3.55	.84	1–5					–	.05	.28*	.18*	.45*	.50*	.54*	.26*	.54*	–.24*	.21*
6. Mastery avoidance	3.45	.89	1–5						–	.19*	.30*	.03	.00	.06	–.26*	–.26*	.42*	–.06*
7. Performance approach	2.79	.93	1–5							–	.72*	.11*	.14*	.23*	–.15*	.21*	.09*	–.08*
8. Performance avoidance	2.86	.94	1–5								–	.07*	.09*	.17*	–.20*	.08*	.21*	–.13*
9. Classroom engagement	3.70	.80	1–5									–	.74*	.49*	.21*	.36*	–.17*	.19*
10. Homework engagement	3.60	.82	1–5										–	.54*	.30*	.43*	–.24*	.23*
11. Meta-cognitive self-regulation	3.44	.71	1–5											–	.16*	.40*	–.13*	.12*
12. Effort regulation	3.34	.86	1–5												–	.33*	–.47*	.30*
13. Math self-concept	3.18	.95	1–5													–	–.41*	.30*
14. Math anxiety	2.77	.89	1–5														–	–.30*
15. Math achievement	14.18	5.36	2–28															–

Gender: 1 = male, 2 = female. * $p < .01$

Table 2 Variance decomposition across student, class and school levels

	Variance at student level (%)	Variance at class level (%)	Variance at school level (%)
Parental involvement in learning	99	0	1
Parental control	96	4	0
Mastery approach	94	6	0
Mastery avoidance	97	3	0
Performance approach	98	1	1
Performance avoidance	97	2	1
Classroom engagement	90	9	1
Homework engagement	93	7	0
Meta-cognitive self-regulation	96	4	0
Effort regulation	92	6	2
Math self-concept	86	14	0
Math anxiety	92	8	0
Math achievement	44	45	11
Previous math achievement	65	24	11

overall measurement model of all the 13 variables with multiple indicators, including the two parenting variables, the four achievement goals, and the seven learning outcomes. The 28 items of the achievement test were grouped according to the four content domains, and consequently there were four composite indicators. There were totally 48 items across the 13 factors, the number of items per factor ranging from 3 to 6. The hierarchical structure of the data was also considered by setting TYPE = COMPLEX and CLUSTER = Class. The measurement model had a good fit: χ^2 (1099) = 2815.88, $p = .00$, $\chi^2/df = 2.56$; Comparative Fit Index (CFI) = .95; Tucker-Lewis index (TLI) = .94; Root Mean Square Error of Approximation (RMSEA) = .031, 90 % confidence interval (CI): .029–.032; Standardized Root Mean Square Residual (SRMR) = .044. The result of CFA provided support for the structural validity of the 13 measured variables, which formed a basis for testing the full mediation model.
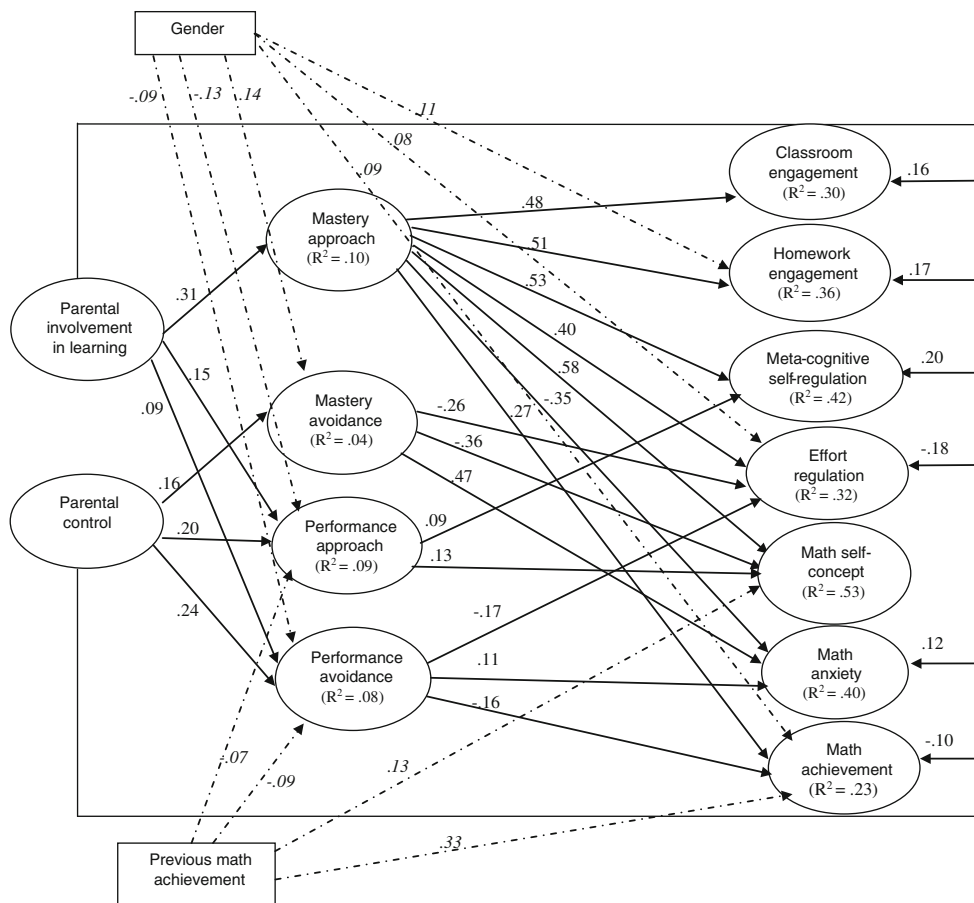
The mediational role of achievement goals was then tested with all the direct effects of the two parenting variables on the seven learning variables controlled. In

addition, we also controlled for the predictive effect of both gender and previous math achievement on achievement goals and the seven learning outcome variables. In addition, the residuals of the four achievement goals were allowed to be correlated and the same to the seven learning outcomes. This model had a good fit to the data: χ^2 (1085) = 2537.74, $p = .00$, $\chi^2/df = 2.34$; CFI = .96; TLI = .95; RMSEA = .028, 90 % CI: .027–.030; SRMR = .039. Figure 1 shows the significant paths as well as the percentages of explained variances in the resulting path model.

The total, direct, and indirect effects of parenting behaviors on learning are shown in Table 3. These effects were tested for statistical significance in Mplus 5.2 by dividing the estimates of the effects by their standard errors which were calculated using the multivariate delta method (see MacKinnon 2008 for more details) and then comparing the ratios with critical values ($z > 2.58$ for $p < .01$) of the normal distribution (personal communication with Linda Muthén 2011). As shown in Fig. 1, parental involvement in learning positively predicted mastery approach, performance approach and performance avoidance goals. Parental control predicted mastery avoidance, performance approach and avoidance goals. Mastery approach goals in turn predicted all the seven variables in an adaptive way. Mastery avoidance goals predicted positively math anxiety, and negatively effort regulation and math self-concept. Performance approach goals in turn predicted positively math self-concept and meta-cognitive self-regulation. The hypothesized predictive relationships from performance approach goals to classroom and homework engagement were not significant. Performance avoidance goals predicted positively math anxiety and negatively effort regulation and math achievement.

As shown in Table 3, parental involvement in learning predicted classroom engagement, homework engagement, and meta-cognitive self-regulation in a positive way both directly and through its positive relationship with mastery approach goals. In addition, parental involvement in learning also predicted the other four variables in an adaptive way mainly through mastery approach goals. As shown in Table 3, the mediating effects of performance approach and avoidance goals between parental involvement and learning were very small or non-significant.

As shown in Table 3, parental control predicted effort regulation, math anxiety, and math achievement in a maladaptive way, and the relationships were partially mediated by mastery and performance avoidance goals. It is noteworthy that between parental control and math self-concept, performance approach goals had a positive and mastery avoidance goals had a negative mediating effect. Because one of the two mediators (i.e., performance approach goals) worked as a suppressor and their effects

Fig. 1 The partial mediation model of achievement goals. *Note.* The values in the parentheses are percentage explained variances. Only significant path coefficients are reported. The correlations among the mediator disturbances are as follows: $r = .05$ ($p = .27$) between mastery approach and mastery avoidance goals, $r = .30$ ($p = .00$) between mastery approach and performance approach goals, $r = .22$ ($p = .00$) between mastery avoidance and performance approach goals, $r = .21$ ($p = .00$) between mastery approach and performance avoidance goals, $r = .36$ ($p = .00$) between mastery avoidance and performance avoidance goals, and $r = .85$ ($p = .00$) between performance approach and avoidance goals

cancelled each other out (MacKinnon et al. 2000), the total effect was not significant (see Table 3).

Discussion

This study was designed to examine the mediational role of achievement goals between parenting behaviors and learning. In general, we found that the four types of achievement goals based on the 2 × 2 achievement goal framework showed differential relationships with both parenting practices and learning variables, and achievement goals partially mediated the relationship between parenting practices and learning.

As hypothesized, parental involvement in learning was associated with a positive learning profile partially due to its positive relationship with mastery approach goals. More specifically, parental involvement was predictive of

children's active engagement and use of meta-cognitive self-regulation strategies in their learning activities both directly and through the mediational role of mastery approach goals. In addition, mainly through its association with mastery approach goals, parental involvement was related to the tendency of children to make effort in the face of challenges and difficulties in their study, achieve high grades, and have high self-concept and low anxiety. The association between parental involvement in learning and a positive learning profile is consistent with the findings from previous studies (Boon 2007; d'Ailly 2003; Duchesne and Ratelle 2010; Gonida et al. 2009; Gonzalez et al. 2002; Grolnick et al. 1991). The mediational role of mastery approach goals between parental involvement and learning supports the position that achievement goals are important lens to understand the relationships between environmental characteristics, such as parenting practices, and learning (Ames 1992; Friedel et al. 2007; Maehr and

Table 3 Standardized total, direct, and indirect effects through achievement goals

Path	Total effects	Direct effects	Total indirect effects	Via mastery approach	Via mastery avoidance	Via performance approach	Via performance avoidance
Parental involvement in learning							
To Classroom engagement	.30*	.15*	.15*	.15*		−.00	
To Homework engagement	.33*	.17*	.16*	.16*		−.00	
To Meta-cognitive self-regulation	.38*	.20*	.18*	.17*		.01	
To Effort regulation	.07	−.04	.11*	.13*			−.02
To Math self-concept	.23*	.03	.20*	.18*		.02*	
To Math anxiety	−.05	.05	−.10*	−.11*			.01
To Math achievement	.09*	.02	.07*	.08*			−.01
Parental control							
To Classroom engagement	−.03	−.02	−.01			−.01	
To Homework engagement	−.00	−.00	−.00			−.00	
To Meta-cognitive self-regulation	.07*	.06	.01			.01	
To Effort regulation	−.26*	−.18*	−.08*		−.04*		−.04*
To Math self-concept	−.04	−.01	−.03		−.06*	.03*	
To Math anxiety	.22*	.12*	.10*		.07*		.03*
To Math achievement	−.14*	−.10*	−.04*				−.04*

* $p < .01$. Due to different sizes of standard errors, some smaller effects are significant while some larger effects are not significant

Midgley 1991; Meece et al. 2006) and also the well established conclusion that students endorsing mastery approach goals tend to have adaptive learning profiles.

It should be noted that parental involvement in learning modestly predicted performance approach and avoidance goals in this study. Rather than assessing general parental warmth and responsiveness in their children's daily life, parental involvement was specific to learning activities in the present study. Although this finding was not consistently reported in previous studies which measured parental involvement in learning (Gonzalez and Wolters 2006; Gonzalez et al. 2002), we argue that parental involvement in children's learning activities might also elicit children's motivation to outperform peers. In other words, parents who concern about their children's learning may set normative standards for their children, such as a baseline grade or rank in the classroom or school, which might encourage adolescents to set goals to outperform and avoid looking inferior than others. This is particularly likely in the educational context of Singapore where achievement examinations are critical for opportunities for further education and success (Liem et al. 2008; Luo et al. 2011b) and the traditional Confucian culture values a high level of parental responsibility for promoting effort and success in the child (Chao 1994). However, after controlling for mastery approach goals, the mediational effect of performance goals was very small or non-significant.

Consistent with our hypothesis, parental control predicted performance approach goals and both mastery and performance avoidance goals. The positive relationship between parental control and performance approach goals is in line with previous studies (Duchesne and Ratelle 2010; Gonzalez and Wolters 2006; Gonzalez et al. 2002). The positive relationship between parental control and the two avoidance goals is noteworthy. In the present study, we found the mean level of mastery avoidance goals of Singapore students was almost as high as the mean of mastery approach goals. In addition, consistent with previous studies in Singapore (Luo et al. 2011a, b), performance approach and avoidance goals were highly correlated with other, suggesting that Singapore students with performance approach goals also tend to adopt performance avoidance goals at the same time. This avoidance tendency might be related to the very competitive educational environment in Singapore (Luo et al. 2011b). In Singapore, educational success is crucial for the future success of individuals, and thus children might develop excessive worries about their failure in schooling and thus endorse an avoidance goal orientation. Parents also know well the importance of academic achievement to the future of their children. Therefore, they might also tend to pressure children to meet their expectations about schooling by coercing compliance and obedience and thus enhance children's avoidance tendency.

In general, parental control was associated to a negative learning profile partially through the two avoidance goals. It predicted a maladaptive coping orientation (low effort regulation and high anxiety) both directly and through

mastery and performance avoidance goals, and it also predicted negatively students' achievement both directly and through performance avoidance goals. Consistent with the findings with Chinese students (d'Ailly 2003; Vansteenkiste et al. 2005), the maladaptive learning profile associated with parental control in the Singapore context support the position of the self-determination theory (Deci and Ryan 2000, 2002) that social environments that promote autonomy are crucial for optimal learning in all cultures. This is in contrast with the finding of Kim et al. (2010) in Korea that parental autonomy support and parental control were modestly and positively correlated with each other and both positively predicted autonomous regulation and mastery goal orientation. We suspect that this might be partly related to the way that parental autonomy or control was operationalized across studies. Many studies including the present one (d'Ailly 2003; Duchesne and Ratelle 2010; Grolnick et al. 1991; Steinberg et al. 1992; Vansteenkiste et al. 2005) measured parental control as children's perceived coerciveness and intrusiveness from parents, sometimes called psychological control, such as "My parents say I shouldn't argue with adults" (Steinberg et al. 1991, 1992) or "My father or mother is less friendly if I do not see things like he or she does"(Vansteenkiste et al. 2005). This type of control is conceptually different from strictness or supervision from parents—the level of monitoring and limit setting by parents, sometimes called behavioral or firm control, such as "how much do your parents really know what you do with your free time" (Gray and Steinberg 1999; Lamborn et al. 1991). Parental strictness or supervision has been found to be positively related to mastery goals and academic performance, and negatively related to external behavioral problems (Boon 2007; Gray and Steinberg 1999). In order to clarify the conceptual and empirical confusion about parental control, Grolnick and Pomerantz (2009) suggested that only the former type of control should be considered as parental control, while the latter frequently labeled control but characterized mainly by guidance should be considered as parental structure. Although the two dimensions were not differentiated in Kim et al. (2010), it is possible that the items used to measure parental control, such as "My parents tell me exactly how to do my work", might be conceptually closer to parental structure than to parental control.

The differential relationships of the four types of achievement goals to learning variables provide discriminant validity data for the 2 × 2 achievement goal framework. In general, we found that mastery approach goals were most beneficial to learning, performance approach goals were weakly associated with a positive learning profile when performance avoidance goals were controlled, particularly self-concept and meta-cognitive regulation

strategies, and mastery avoidance and performance avoidance goals were generally related to a negative learning profile. Although both mastery avoidance and performance avoidance goals encompassed an avoidance tendency towards challenges and difficulties in study, the former reflected an intrinsic anxiety about failure to learn and related to low self-concept, while the latter reflected an extrinsic anxiety about demonstrating low competence relative to others and related to low achievement.

The findings of this study have important implications for parents, school leaders, and policy makers. Since parental involvement in a child's education is an important mechanism through which children are socialized for academic success, parents are encouraged to spend more time assisting and supporting their children in their learning activities. In addition, schools are also encouraged to provide better conditions to increase the levels of parental involvement in school, such as through more effective communications with parents about their children's progress. In addition, as called for by Sternberg (2001), more public campaigns should be launched to educate parents about children and adolescents' development as well as how to build more effective children-parents relationships. For example, in this study we found that it is important for parents to accept their adolescent children's needs for psychological autonomy so that children will tend to develop a more healthy coping orientation in the face of difficulties in their study. Parents should be taught how to provide appropriate autonomy support to their adolescent children.

This study has some limitations which should be taken into account when readers interpret the findings. First, the proposed causal ordering among parenting, achievement goals and learning outcomes cannot be justified by the cross-sectional nature of this study. The parenting practices are interactive processes between parents and children. For example, if children have themselves engaged in their own study, they may ask their parents to be frequently involved in their learning activities at home, such as seeking help or having discussions with their parents, which may further encourage the children to work harder in their study. Therefore, longitudinal studies with more detailed observations should be conducted in order to understand the dynamic interplay between parents and children. Second, the scale assessing mastery avoidance goals adapted from the original Achievement Goal Questionnaire (Elliot and McGregor 2001) contains affective content (e.g., "I'm afraid···"). Although affect is implied when a person is committed to the pursuit of any goals (Elliot and Murayama 2008), explicit reference to affective content in the goal items might to some extent confound the relationship between mastery avoidance goals and the affective learning outcomes in this study. The affective content has been omitted in the more recently revised AGQ-R (Elliot and

Murayama 2008). Third, the results of this study might not be generalized to younger or older students, because the relative importance of these two dimensions of parenting practices might change across age (Purdie et al. 2004). In addition, this study examined the mediational role of achievement goals in the context of math study. Future studies should investigate whether the findings can be generalized to other subject domains.

References

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84*, 261–271.

Barron, K. E., & Harackiewicz, J. M. (2001). Achievement goals and optimal motivation: Testing multiple goal models. *Journal of Personality and Social Psychology, 80*, 706–722.

Bong, M. (2001). Between- and within-domain relations of academic motivation among middle and high school students: Self-efficacy, task value, and achievement goals. *Journal of Educational Psychology, 93*, 23–24.

Boon, H. J. (2007). Low- and high-achieving Australian secondary school students: Their parenting, motivations, and academic achievement. *Australian Psychologist, 42*, 212–225.

Chao, R. K. (1994). Beyond parental control and authoritarian parenting style: Understanding Chinese parenting through the cultural notion of training. *Child Development, 65*, 1111–1119.

Chirkov, V. I., & Ryan, R. M. (2001). Parent and teacher autonomy-support in Russian and U.S. adolescents: Common effects on well-being and academic motivation. *Journal of Cross-Cultural Psychology, 32*, 618–635.

Cury, F., Elliot, A. J., Da Fonseca, D., & Moller, A. C. (2006). The social-cognitive model of achievement motivation and the 2 × 2 achievement goal framework. *Journal of Personality and Social Psychology, 90*, 666–679.

d'Ailly, H. (2003). Children's autonomy and perceived control in learning: A model of motivation and achievement in Taiwan. *Journal of Educational Psychology, 95*, 84–96.

Deci, E. L., & Ryan, A. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268.

Deci, E. L., & Ryan, R. M. (Eds.). (2002). *Handbook of self-determination research*. Rochester, NY: University of Rochester Press.

Duchesne, S., & Ratelle, C. F. (2010). Parental behaviors and adolescents' achievement goals at the beginning of middle school: Emotional problems as potential mediators. *Journal of Educational Psychology, 102*(2), 497–507.

Dweck, C. S., & Leggett, E. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256–273.

Elliot, A. J., & Church, M. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*, 218–232.

Elliot, A. J., & Harackiewicz, J. M. (1996). Approach and avoidance achievement goals and intrinsic motivation: A mediational analysis. *Journal of Personality and Social Psychology, 72*, 218–232.

Elliot, A. J., & McGregor, H. A. (2001). A 2 × 2 achievement goal framework. *Journal of Personality and Social Psychology, 80*(3), 501–519.

Elliot, A. J., & Murayama, K. (2008). On the measurement of achievement goals: Critique, illustration, and application. *Journal of Educational Psychology, 100*(3), 613–628.

Friedel, J. M., Cortina, K. S., Turner, J. C., & Midgley, C. (2007). Achievement goals, efficacy beliefs and coping strategies in mathematics: The roles of perceived parent and teacher goal emphases. *Contemporary Educational Psychology, 32*, 434–458.

Gonida, E. N., Voulala, K., & Kiosseoglou, G. (2009). Students' achievement goal orientations and their behavioral and emotional engagement: Co-examining the role of perceived school goals structures and parent goals during adolescence. *Learning and Individual Differences, 19*, 53–60.

Gonzalez, A. L., & Wolters, C. A. (2006). The relation between perceived parenting practices and achievement motivation in mathematics. *Journal of Research in Childhood Education, 21*, 203–217.

Gonzalez, A. R., Doan Holbein, M. F., & Quilter, S. (2002). High school students' goal orientations and their relationship to perceived parenting styles. *Contemporary Educational Psychology, 27*, 450–470.

Gray, M. R., & Steinberg, L. (1999). Unpacking authoritative parenting: Reassessing a multidimensional construct. *Journal of Marriage and Family, 61*, 574–587.

Grolnick, W. S., & Pomerantz, E. M. (2009). Issues and challenges in studying parental control: Toward a new conceptualization. *Child Development Perspectives, 3*(3), 165–170.

Grolnick, W. S., & Ryan, R. M. (1989). Parent styles associated with children's self-regulation and competence in school. *Journal of Educational Psychology, 81*, 143–154.

Grolnick, W. S., Ryan, A. M., & Deci, E. L. (1991). Inner resources for school achievement: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology, 53*, 508–517.

Gurland, S. T., & Grolnick, W. S. (2005). Perceived threat, controlling parenting, and children's achievement orientations. *Motivation and Emotion, 29*, 103–121.

Harackiewicz, J. M., Barron, K. E., Carter, S. M., Lehto, A. T., & Elliot, A. J. (1997). Predictors and consequences of achievement goals in the college classroom: Maintaining interest and making the grade. *Journal of Personality and Social Psychology, 73*, 1284–1295.

Harackiewicz, J. M., Barron, K. E., Tauer, J. M., Carter, S. M., & Elliot, A. J. (2000). Short-term and long-term consequences of achievement goals in college: Predicting continued interest and performance over time. *Journal of Educational Psychology, 92*, 316–330.

Hau, K. T., & Salili, F. (1991). Structure and semantic differential placement of specific causes: Academic causal attributions by Chinese students in Hong Kong. *International Journal of Psychology, 26*, 175–193.

Kaplan, A., Middleton, M. J., Urdan, T., & Midgley, C. (2002). Achievement goals and goal structures. In C. Midgley (Ed.), *Goals, goal structures and patterns of adaptive learning* (pp. 21–53). Mahwah, NJ: Erlbaum.

Karabenick, S. A. (2003). Seeking help in large college classes: A person-centred approach. *Contemporary Educational Psychology, 28*, 37–58.

Kim, J., Schallert, D., & Kim, M. (2010). An integrative cultural view of achievement motivation: Parental and classroom predictors of

children's goal orientations when learning mathematics in Korea. *Journal of Educational Psychology, 102*(2), 418–437.

Krull, J. L., & MacKinnon, D. P. (2001). Multilevel modeling of individual and group-level mediated effects. *Multivariate Behavioral Research, 36*, 249–277.

Lamborn, S. D., Mounts, N. S., Steinberg, L., & Dornbusch, S. M. (1991). Patterns of competence and adjustment among adolescents from authoritative, authoritarian, indulgent, and neglectful homes. *Child Development, 62*, 1049–1065.

Lau, S., & Nie, Y. (2008). Interplay between personal goals and classroom goal structures in predicting student outcomes: A multilevel analysis of person-context interactions. *Journal of Educational Psychology, 100*(1), 25–29.

Lee, J. (2009). Universals and specifics of math self-concept, math self-efficacy, and math anxiety across 41 PISA 2003 participating countries. *Learning and Individual Differences, 19*, 355–365.

Liem, A. D., Lau, S., & Nie, Y. (2008). The role of self-efficacy, task value, and achievement goals in predicting learning strategies, task disengagement, peer relationship, and achievement outcome. *Contemporary Educational Psychology, 33*, 486–512.

Luo, W., Hogan, D., & Paris, S. G. (2011a). Predicting Singapore students' achievement goals in their English study: Self-construal and classroom goal structure. *Learning and Individual Differences, 21*, 526–535.

Luo, W., Paris, S. G., Hogan, D., & Luo, Z. (2011b). Do performance goals promote learning? A pattern analysis of Singapore students' achievement goals. *Contemporary Educational Psychology, 36*, 165–176.

MacKinnon, D. P. (2008). *Introduction to statistical mediation analysis*. New York: Lawrence Elbaum Associates.

MacKinnon, D. P., Krull, J. L., & Lockwood, C. M. (2000). Equivalence of the mediation, confounding and suppression effect. *Prevention Science, 1*, 173–181.

Maehr, M. L., & Midgley, C. (1991). Enhancing student motivation: A school wide approach. *Educational Psychologist, 26*, 399–427.

Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation and academic achievement. *Annual Review of Psychology, 57*, 487–503.

Middleton, M., Kaplan, A., & Midgley, C. (2004). The change in middle school students' achievement goals in math over time. *Social Psychology of Education, 7*, 289–311.

Midgley, C., Kaplan, A., Middleton, M., Maehr, M. L., Urdan, T., Anderman, L. H., et al. (1998). The development and validation of scales assessing students' achievement goal orientations. *Contemporary Educational Psychology, 23*, 113–131.

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., & Freeman, K. E. (2000). *Manual for the patterns of adaptive learning scales (PALS)*. Ann Arbor: University of Michigan.

Midgley, C., Kaplan, A., & Middleton, M. (2001). Performance approach goals: good for what, for whom, under what circumstances, and at what cost? *Journal of Educational Psychology, 93*, 77–86.

Muthén, L., & Muthén, B. (2010). *Mplus statistical analysis with latent variables: User's guide*. Los Angeles, CA: Muthén & Muthén.

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91*, 328–346.

Pajares, F., Britner, S. L., & Valiante, G. (2000). Relation between achievement goals and self-beliefs of middle school students in writing and science. *Contemporary Educational Psychology, 25*, 406–422.

Pintrich, P. R. (2000). An achievement goal theory perspective on issues in motivation terminology, theory, and research. *Contemporary Educational Psychology, 25*, 92–104.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement, 53*, 801–813.

Purdie, N., Carroll, A., & Roche, L. (2004). Parenting and adolescent self-regulation. *Journal of Adolescence, 27*, 663–676.

Ryan, A. M., & Pintrich, P. R. (1997). "Should I ask for help?" The role of motivation and attitudes in adolescents' help seeking in math class. *Journal of Educational Psychology, 89*, 329–341.

Salili, F. (1996). Accepting personal responsibility for learning. In D. Watkins & J. B. Biggs (Eds.), *The Chinese learner: Cultural, psychological, and contextual influences* (pp. 85–105). Hong Kong: Comparative Education Research Centre.

Salili, F., Chiu, C., & Lai, S. (2001). The influence of culture and context on students' motivational orientation and performance. In F. Salili, C. Chiu, & Y. Hong (Eds.), *Student motivation: The culture and context of learning*. New York: Kluwer Academic/Plenum.

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology, 19*, 460–475.

Steinberg, L., Mounts, N. S., Lamborn, S. D., & Dornbusch, S. M. (1991). Authoritative parenting and adolescent adjustment across varied ecological niches. *Journal of Research on Adolescence, 1*(1), 19–36.

Steinberg, L., Lamborn, S. D., Dornbusch, S. M., & Darling, N. (1992). Impact of parenting practices on adolescent achievement: Authoritative parenting, school involvement, and encouragement to succeed. *Child Development, 63*, 1266–1281.

Urdan, T. C., Ryan, A. M., Anderman, E. M., & Gheen, M. H. (2002). Goals, goal structures, and avoidance behaviors. In C. Midgley (Ed.), *Goals, goal structures, and patterns of adaptive learning* (pp. 55–83). Mahwah, NJ: Erlbaum.

Van Yperen, N. W. (2006). A novel approach to assessing achievement goals in the context of the 2×2 framework: Identifying distinct profiles of individuals with different dominant achievement goals. *Personality and Social Psychology Bulletin, 32*(11), 1432–1445.

VanDamme, J., Bieke, D. F., Van Landeghem, G., Opdenakker, M. G., & Onghena, P. (2002). A new study on educational effectiveness in secondary schools in Flanders: An introduction. *School Effectiveness and School Improvement, 13*(4), 383–397.

Vansteenkiste, M., Zhou, M., Lens, W., & Soenens, B. (2005). Experiences of autonomy and control among Chinese learners: Vitalizing or immobilizing? *Journal of Educational Psychology, 97*, 468–483.

Wellborn, J. G., & Connell, J. P. (1987). *Manual for the Rochester assessment package for schools*. Rochester, NY: University of Rochester.

Yeo, G., Loft, S., Xiao, T., & Kiewitz, C. (2009). Goal orientations and performance: Differential relationships across levels of analysis and as a function of task demands. *Journal of Applied Psychology, 94*(3), 710–726.