

*Learning Accelerator Research Paper*

# The Moderating Effects of Psychosocial Factors on Achievement Gains: A Longitudinal Study perspective

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2020

Kuo, Y.K., Casillas, A., Allen, J., & Robbins, S.B. (2020). The Moderating Effects of Psychosocial Factors on Achievement Gains: A Longitudinal Study. *Journal of Educational Psychology*.

This is a draft of a manuscript entitled *The Moderating Effects of Psychosocial Factors on Achievement Gains: A Longitudinal Study* and the copy of record is with the American Psychological Association (<https://doi.org/10.1037/edu0000471>).



The Moderating Effects of Psychosocial Factors on Achievement Gains: A Longitudinal Study

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### Abstract

The moderating effects of motivation, social control, and self-regulation in predicting academic achievement were examined in grades 11-12 for 3,281 7<sup>th</sup> - 9<sup>th</sup> graders. Standardized assessments of college readiness and student self-reported measures of psychosocial factors were used in the study. The results showed that females in grades 7-9 scored higher than males for motivation and self-regulation. In predicting later achievement in grades 11-12, motivation and social control moderated prior achievement, while self-regulation moderated both sex and prior achievement. Particularly among female students, effects of self-regulation were positive for high-achieving females (percentile rank  $\geq 95$ ) and negative for low-achieving females (percentile rank  $\leq 5$ ) in predicting achievement in grades 11-12. The phenomenon known as the “Matthew Effect” and implications for classroom teachers and educational policymakers are discussed.

*Keywords:* academic achievement, motivation, social control, self-regulation

### Educational Impact and Implications Statement

The significance of this study is to help educators and policy makers better understand how combinations of psychosocial skills and middle school achievement impact future academic achievement in high school. Our findings show that students who have sufficient core academic skills and better psychosocial skills in middle school are more likely to succeed in high school. In light of the *Every Student Succeeds Act*, this study contributes to the growing discussion on how to promote broader approaches that integrate psychosocial learning in secondary school.

## The Moderating Effects of Psychosocial Factors on Achievement Gains: A Longitudinal Study

In the Aesop's fable, "The Tortoise and The Hare", a tortoise challenged a hare "Dare to race?" The hare took the invitation, believing that he would easily win the race. The hare ran fast at the beginning. After a while, he turned his head and found the tortoise was left far behind. "Why not take a nap? I will win this race for sure," he thought, and then went to sleep right away. Nevertheless, the tortoise kept moving, though slowly, passed the snoozing hare, and won the race. Psychosocial factors (PSFs) such as sustained effort or, broadly, motivation are often embedded in these kinds of fables as a way to illustrate how competences in any domain of non-trivial difficulty can compensate for shortcomings in other areas (Kuo, 2011).

How individuals gain from little to substantial competence in particular domains has been addressed in the substantial research (Ericsson, Hoffman, Kozbelt, & Williams, 2018; Horn & Masunaga, 2006). Deliberate, well-structured and continued practice over many years are central to develop and maintain expert-like skills (Ericsson et al., 2018). For example, Simon and Chase (1973) found that ten years, at least, of continuous practice in a professional domain are required to develop expertise. In school, sustained effort has been identified as a significant indicator of long-term academic achievement.

PSFs, such as motivation, social control, and self-regulation, have been identified as keys for success in educational settings, particularly in secondary school (Nagaoka, Farrington, Ehrlich, & Heath, 2015; The Aspen Institute National Commission on Social, Emotional, and Academic Development (NCSEAD), 2018; Zins, Bloodworth, Weissberg, & Walberg, 2007). To achieve academic success, students need to be highly motivated to learn in preferred subjects, to identify accessible social supports to facilitate their learning, and to regulate and manage their behaviors and emotions in school. Further, Snow, Corno, and Jackson (1996) argued that affective (temperament and emotion), conative (motivation and volition), and cognitive (procedural and declarative knowledge) individual differences should be considered simultaneously when predicting students' scholastic performance and vice versa. Indeed, from a broader perspective, PSFs and prior academic achievement have been predictors of later achievement in K-12, college, and beyond (Camara, O'Connor, Mattern, & Hanson, 2015; Casillas et al., 2012; Farrington et al., 2012; Kuo, Allen, & Casillas, 2019; Kyllonen, Walters, & Kaufman, 2005; Lounsbury, Sundstrom, Loveland, & Gibson, 2003; Moore et al., 2015; Oberle, Schonert-Reichl, Hertzman, & Zumbo, 2014; Payton et al., 2008; Poropat, 2009; Zins et al., 2007).

Past research has indicated that PSFs such as motivation and persistence provide incremental contribution to cognitive factors, such as general mental ability and prior achievement, in predicting future academic outcomes (e.g., Grigorenko et al., 2009; Lounsbury et al., 2003; Yen, Konold, & McDemott, 2004). Casillas et al. (2012) proposed a broad assessment framework consisting of PSFs (i.e., motivation, social control, and self-regulation), school behaviors (e.g., frequency of being absent, being held back, homework time, etc.), and prior academic achievement with demographic and school-level factors in predicting later

academic outcomes. Using a large cohort of middle school students, they found that PSFs add modest incremental validity in prediction models.

Using a sub-sample of the aforementioned study, Kuo (2011) examined the effects of motivation, social control, and self-regulation for 1,384 8<sup>th</sup> grade students in predicting their 10<sup>th</sup> grade academic achievement. He found that motivation and social control interacted with sex and prior achievement when predicting later achievement. In particular, among female students, effects were positive for high-achieving students and negative for low-achieving students for both motivation and social control; effects were not found for male students. Different from the effects of motivation and social control, self-regulation partially mediated prior achievement when predicting later academic achievement. As urged by Burrus et al. (2013), more longitudinal studies of PSFs with large representative samples are needed to rigorously examine the effects of PSFs on school success. Expanding on Kuo's two-year longitudinal study, three major PSFs—motivation, social control, and self-regulation—were examined in this study. These three PSFs have shown to predict important educational outcomes, as described below.

### **Motivation and Academic Achievement**

Although the earliest scientific studies of human motivation date back to Freud's work in the late 19<sup>th</sup> century (Atkinson, 1964), the definition of motivation from a cognitive perspective, “the process whereby goal-directed activities are instigated and sustained” (Schunk, Meece, & Pintrich, 2014, p.5), reflects today's general consensus. In the late 20<sup>th</sup> century, as mentioned earlier, Snow et al. (1996) argued that affective, conative, and cognitive aptitudes should be considered simultaneously in learning contexts. Given this aptitude framework, the conative attitude includes predecisional process (called “motivation”) and postdecisional process (call “volition”), which was tied by “Rubicon” (i.e., commitment to action goals) as a recursive and dynamic model of conation (Corno, 1993; Snow et al., 1996). Further, motivation here emphasizes how to form and commit to goals, while volition focuses on how to achieve goals through efforts, actions, and self-regulatory process. As Snow et al. (1996) described, “When an individual makes a decision to pursue a particular goal, the motivational state is terminated and the volitional state is begun” (p. 248).

In this study, the concepts of “motivation” are broadly captured by both predecisional (motivational) and postdecisional (volitional) processes. Consistent with earlier studies (Casillas et al., 2012; Robbins, Oh, Le, & Button, 2009), motivation refers to “the self-regulatory mechanism by which individuals act on prescribed behaviors and implement learning activities and/or pursue goals” (Casillas et al., 2012, p. 409). Specifically, motivation is represented by academic discipline (e.g., students show sustained effort to complete schoolwork), commitment to school (e.g., students are committed to obtain a degree), and optimism<sup>1</sup> (e.g., students keep a positive outlook to achieve goals when encountering difficulties or challenges).

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<sup>1</sup> Since the mid-1980s, optimism also has been studied in individual differences as a personality characteristic (Carver & Scheier, 2014; Peterson, 2000). McCrae and Sutin (2018) argued that individual personality traits would interact with external environment to develop individual characteristic adaptations (e.g., habits, skills, and beliefs) and then cause behaviors. The definition of optimism in this study, “having a hopeful outlook about the future in spite of difficulties or challenges” (see Appendix; ACT, 2011), is consistent with the concepts of dispositional

Motivation has been studied from the perspective of self-regulation in an ongoing and cyclical metacognitive process (Reeve, 2018). Based on a social cognitive perspective, Zimmerman (2011) described motivation through self-regulation of learning (SRL) consisting of three cyclical phases: forethought, performance, and self-reflection. Consistent with the concepts of motivation interpreted by predecisional (motivation) and postdecisional (volitional) processes (Corno, 1993), along with the self-motivation feelings/beliefs, students develop the goals and strategic plans for action (predecisional process) in the forethought phase, perform behaviors (postdecisional process) in the performance (volitional) phase, and reflect on their actions in the self-reflection phase (Zimmerman, 2011). During the forethought and performance phase, self-efficacy plays a significant role in the effectiveness of goal setting and choice of action strategies (Vancouver, 2018; Schunk et al., 2014; Zimmerman, 2011). Bandura (1997) defined self-efficacy as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainment” (p. 3). Unified into the aforementioned SRL framework, self-efficacy has been treated as a key motivational construct in social cognitive theory, which is associated with students’ SRL behaviors during motivational and volitional processes in pursuing their goals (Schunk et al., 2014; Snow et al., 1996; Zimmerman, 2011).

Sex differences may lead to the varying degrees of perceived self-efficacy. For example, past studies showed that SRL behaviors to carry out learning activities and, in turn, to achieve learning goals may differ due to sex differences in self-efficacy (e.g., Pajares, 2002; Bidjerano, 2005). Zimmerman and Martinez-Pons (1990) found that female students demonstrated better goal-setting, strategies for planning to study, keeping records, and self-monitoring. These behaviors are usually found in students who are hardworking, conscientious, and who complete school work.

Regarding the relationships between motivation and academic achievement, past studies have shown that highly motivated students are more likely to attain better academic performance (e.g., Casillas et al., 2012; Hustinx, Kuyper, van der Werf, & Dijkstra, 2009; Peterson, Casillas, & Robbins, 2006; Pintrich & De Groot, 1990; Steinmayr & Spinath, 2009). When compared to students in elementary school and college, students in high school tend to be less motivated and more disengaged from learning activities (Martin, 2009). Students who are less motivated to learn are more likely to have poor course grades and, in turn, demonstrate a greater likelihood of dropping out during high school (Allensworth & Easton, 2007; Balfanz, Herzog, & Mac Iver, 2007; Rumberger & Lim, 2008). In addition, while examining students with General Education Degrees (GEDs), it has been found that GED recipients showed lower perseverance and planning skills in comparison with non-dropout peers (Heckman, Humphries, & Kautz, 2014; Heckman & Rubinstein, 2001). One possible reason to explain why improving motivation could result in

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optimism rooted in expectancy-incentive motive theories where confidence shows an impact on the effort toward goals (Carver & Scheier, 2014). Further, students having confidence to believe their behaviors will result in positive outcomes once they are enacted tend to demonstrate more self-regulatory resources to attain goals where they put forth more effort (Carver & Scheier, 2014). Thus, optimism considered as a personality characteristic serves as an important dimension of motivation to predict motivation-related outcomes in education and work contexts (Carver & Scheier, 2014; Reeve, 2018).

better academic achievement is that highly motivated students select more stimulating and challenging learning environments in which they can develop better learning skills (Shiner, 2000).

Not all studies support the effects of motivation in predicting student academic outcomes. For instance, Gagné and St Pére (2001) examined 8th grade students in a female high school and found that motivation did not predict academic performance after controlling for students' intelligence. However, some critics of this study pointed out that restricted range of motivation in the study participants, an instrument with insufficient evidence of construct-related validity, and a short-term study design may have led to the failure to observe effects for motivation (e.g., Hustinx et al., 2009; Steinmayr & Spinath, 2009).

Given past findings on sex differences based on self-efficacy and attribution theories, in this study, it is hypothesized that female students will score higher than male students on measures of motivation, and that sex does will not moderate motivation when predicting later academic achievement.

### **Social Control and Academic Achievement**

Ryan and Deci (2017) proposed self-determination theory which describes how an individual could be intrinsically motivated through satisfying three psychological needs, including autonomy, competence, and relatedness within a social context. Among these needs, relatedness refers to how an individual feels warm, cared for by others, has a sense of mutual concern (belonging), and is socially connected (Ryan & Deci, 2017; Reeve, 2018). Studies showed that students' feelings of relatedness, such as parental school-based and home-based involvement in schooling and school belonging or connection, have direct and indirect influences on academic success, even when they encounter challenge or difficulties (Furrer & Skinner, 2003; Schunk et al., 2014). In addition, Moller, Deci and Elliot (2010) found that learners who perceived greater relatedness supported by other people reported anticipating and experiencing higher sense of relatedness when opportunities to interact with others come up.

Aligned with earlier studies (Casillas et al., 2012; Robbins et al., 2009), social control in this study refers to "an individual's skills in engaging the social environment in ways that support and reinforce his or her learning activities" (Casillas et al., 2012, p. 409). Specifically, social control is represented by students' perception of their family's attitudes toward the value of education, their family's involvement in students' school life and activities, their relationships with school staff, and their feelings of school safety and security. The term "control" here is used to describe a learner as an active agent who use formal and informal social connections or networks to help them maintain feelings of relatedness (Robbins et al., 2009).

Family, the earliest context for learning, plays an important role in students' learning of a broad range of skills (Barton & Coley, 2007). Parental school-based and home-based involvement in schooling signals parents' attitude of the importance of education (Schunk et al., 2014). In a longitudinal study, Isakson and Jarvis (1999) found that students who perceive support from parents or other family members tend to make better life and academic adjustments during the transition from middle school to high school. Further, meta-analytic studies showed

that parents' aspirations and expectations for children's education significantly predict their academic outcomes (e.g., Fan & Chen, 2001; Hill & Tyson, 2009; Kim & Hill, 2015). Schunk et al. (2014) argued that parental involvement and their child's motivation may have reciprocal effects. That is, when children are motivated to achieve academic success because of their perception of parents' support and aspirations or expectation on education, their parents tend to provide more encouragement and assistance for school life and activities.

Regarding sex differences in parental involvement, unlike some South and East Asian countries, sociologists argue that parents in the United States do not tend to demonstrate strong preferences for sons or daughters, though they are involved in children's schooling in different ways (Raley & Bianchi, 2006). Examining a nationally representative sample of about 25,000 students in grade 8 from the National Education Longitudinal Study, Carter and Wojtkiewicz (2000) found that parents are more likely to discuss school life and show higher educational expectations with daughters, while they may be more involved with school activities (e.g., attend a school conference, contact with teachers or counselors, or visit the classroom) on behalf of sons, spend more time to check son's homework and limit his going out (i.e., parental supervision). These different parental home-based and school-based involvements may come from parents' perception from current social, economic, and political environments (Raley & Bianchi, 2006). For example, different from Carter and Wojtkiewicz's study (2000), Eamon (2005) found Latino females perceive more parental supervision than males.

In an educational context, students' relatedness needs could be satisfied by the respectful and trusting relations with school personnel including teachers and administrative staff (Schunk et al., 2014). Further, students' perception of personal resources in school supports their learning (Robbins et al., 2009). For example, when students perceive that teachers and administrative staff are willing to provide higher levels of support for learning activities, they tend to search for support and learning resources in school. In turn, they may attend class more often and demonstrate better educational outcomes (Allensworth & Easton, 2007; Fredricks, Blumenfeld, & Paris, 2004;; Lleras, 2008). In contrast, students who disengage from educational support groups have fewer opportunities to achieve learning goals (Inglés, Aparisi, García-Fernández, Núñez, & Martínez, 2016; Schunk et al., 2014).

Past studies show that females reported better relationships with school staff than males and this advantage dominates across education levels (Furrer & Skinner, 2003; Gillen-O'Neel & Fuligni, 2013). One possible reason is that females' behaviors are more likely to meet school or teachers' expectation than males, though these differences may be reduced in high school (Gillen-O'Neel & Fuligni, 2013). In addition, students who perceive safety and security in school are less likely to demonstrate deviant and delinquent behaviors and are more likely to participate in learning activities and, in turn, perform better (Brand, Felner, Shim, Seitsinger, & Dumas, 2003; Gietz & McIntosh, 2014; Goldstein, Young, & Boyd, 2008; Gronna & Chin-Chance, 1999; Schunk et al., 2014; Sprague & Walker, 2005). Different from the studies of student-school staff relations, significant sex differences in students' perception of school safety was not found in past studies (e.g., Brand et al., 2003; Goldstein et al., 2008).



Given the theoretical background of relatedness needs and mixed findings of sex differences in the aforementioned four dimensions of social control, it is hypothesized that there is no sex differences on measures of social control, while sex moderates with social control in predicting academic achievement.

### **Self-regulation and Academic Achievement**

Different from social control, self-regulation is parallel with the concept of personal or self-control, characterized as being self-initiated (Duckworth, Taxer, Eskreis-Winkler, Galla, & Gross, 2019). Consistent with Casillas et al. (2012), self-regulation in this study refers to “the ability to self-manage or regulate attitudes, behaviors, and feelings that affect students’ receptiveness to, and implementation of, learning activities” (p. 410). It is represented by students’ ability to appropriately manage and express their emotions, behaviors, and impulses in school contexts.

Some self-regulation studies have focused on regulation of deviant behavior and maintenance of proper behavior by avoidance of disruptive and anti-social behaviors (e.g., Rothman, Baldwin, Hertel, & Fuglestad, 2011), while other studies underscored regulating emotions (e.g., Cole, Martin, & Dennis, 2004; Gross, 2014; Robbins et al., 2009). Referring to the construct of emotion-related regulation, Koole, Van Dillen, & Sheppes (2011) described it as a control process where individuals show acceptable and appropriate responses to events spontaneously. Instead of considering behavior and emotion regulation independently, Carver (2004) suggested that two regulatory processes, approach and avoidance processes, into which emotions are embedded. Given this dual-process theory, individuals are able to respond to environments in an appropriate manner with a combination of reactions and feelings (see Carver, 2004, for the detailed discussion). Zimmerman (2000) argued that dysfunctions in self-regulation may come from ineffective forethought before responses. A line of research from personality psychology suggests that acting without adequate thought, a form of behavioral disinhibition, is a facet in impulsivity, which leads to a lack of behavioral control (DeYoung, 2011; Dickman, 1990).

Prior meta-analysis studies of self-regulation show that females demonstrate higher levels of self-control than males (e.g., Card, Stucky, Sawalani, & Little, 2008; de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). Sex differences in self-regulation may be explained by sexual selection theory, biological evolution, and socialization process. That is, females are likely less involved in deviant behaviors because of the intra-female competition (e.g., maintain sexual or social reputations), lower physical strength, and higher levels of perception of adults’ encouragement to meet social norms (Card et al., 2008).

The relationships between self-regulation and academic achievement in secondary school have been examined in past studies. It has been thoroughly documented that students failing to regulate behaviors and emotions and/or showing antisocial behaviors are more likely to demonstrate poor academic performance (Duckworth et al., 2019; Finn & Rock, 1997; Gumora & Arsenio, 2002; Roeser, Eccles, & Sameroff, 2000; Wentzel, 1993), while other research found that both an over and under inhibition of strong emotions may be harmful to academic outcomes

(Robbins, Allen, Casillas, Peterson, & Le, 2006). Also, students who regulate their impulsive behaviors tend to achieve academic success in school (Casillas et al., 2012; Duckworth & Seligman, 2005; Vigil-Colet & Morales-Vives, 2005).

Given the theories and findings of literature review, it is hypothesized that females will report higher level self-regulation than males and that sex will moderate with self-regulation in the prediction of later achievement.

### **Is the Matthew Effect Evident in PSFs?**

The Matthew Effect, a phenomenon referred to as “the rich get richer and the poor get poorer”, has been observed in a variety of educational interventions and programs in predicting academic success (e.g., Ceci & Papierno, 2005; Kerckhoff & Glennie, 1999; Pfof, Hattie, Dörfler, & Artelt, 2014; Walberg & Tsai, 1983). This effect has been broadly defined as “the amplification of any initial advantage (e.g., economic resources, health status, cognitive ability) that leads to cumulative differences that widen preexisting gaps” (Ceci & Papierno, 2005, p. 149). For example, attaining a higher education level (the intervention) is more beneficial for individuals with high cognitive ability (the “rich”) in elevating their social-economic outcomes (getting “richer”) (Gottfredson, 2011).

In educational contexts, the Matthew Effect is one theory for explaining why the variability of achievement and ability increases over time, which leads to a widening gap between high-achieving and low-achieving students. Several studies of interventions and school characteristics have shown these increases in variance (e.g., Ceci & Papierno, 2005; Konstantopoulos, 2008; Pfof et al., 2014; Stanovich, 1986; Walberg & Tsai, 1983). For example, Walberg and Tsai (1983) conducted a longitudinal study through National Assessment of Educational Progress and found that prior educational background, current educational experience, and motivation significantly predict academic achievement individually and together, while the cumulating advantageous effects of these three factors were evidenced in the prediction models. Stated differently, students possessing better prior educational background tend to have better educational experience and be motivated to learn. Furthermore, the cumulative advantages of these factors show predictive power for later academic outcomes. Consequently, the achievement gap is widening over time due to students’ increasing differences in educational backgrounds.

In addition to explaining the multiplicative effects of pre-existing biographical background, learning experiences, and psychosocial factors, the Matthew Effect has also been used to explain why disadvantaged students may not benefit from universal interventions that were designed for all students (Ceci & Papierno, 2005). For example, when young academically-talented students and their non-academically talented counterparts received the same cognitive strategy interventions at the same time, the achievement gap significantly increased from the beginning toward the end of the intervention (Borkowski & Peck, 1986). Thus, when providing the same or similar educational resources such as instruction, curriculum, or enriched learning environment to all students, high-achieving students usually gain more than low-achieving students, and accordingly, the achievement gap between these two groups is likely

to increase across time (e.g., Borkowski & Peck, 1986; Ceci & Papierno, 2005; Kerckhoff & Glennie, 1999). Interestingly, contrary to the findings of the Matthew Effect in earlier intervention studies, Schwartz, Cheng, Salehi, Wieman (2016) found that the reverse effect exists in some studies of universal socio-cognitive interventions (e.g., psychological intervention in Yeager et al., 2016) which particularly benefit disadvantaged students (e.g., low-achieving students), rather than advantaged students (e.g., high-achieving students), and, in turn, reduced the gap between advantaged and disadvantaged students over time.

The present study explores the Matthew Effect from prior academic achievement and pre-existing PSFs. Based on the aforementioned studies (e.g., Walberg & Tsai, 1983), it seems reasonable to hypothesize that students with higher prior academic achievement may benefit from particular PSFs such as motivation, social control, and self-regulation, and, in turn, gain more in achievement over time.

Previous studies show that a combination of prior academic achievement and individual PSFs could improve prediction of students' later academic success (e.g., Casillas et al., 2012; Grigorenko et al., 2009), but the interactions between prior academic achievement and PSFs have not been fully investigated. Specifically, it still remains unclear how PSFs moderate with prior academic achievement and sex in predicting later academic outcomes. For instance, it is unknown whether PSFs show different effects for students with different initial academic achievement or whether PSFs impact males or females differently. In predicting later academic success, low-achieving students may benefit from some PSFs, whereas high-achieving students receiving other PSFs may gain more in their continued academic success. Likewise, some PSFs may have more significant effects for female than male students.

### **The Present Study**

This study examines the effects of PSFs and sex when predicting academic achievement in grades 11-12 among students in grades 7-9. Further, it aims to better understand the differential PSF effects of academic achievement and sex. The research questions of this study are: (1) Do male and female students in grades 7-9 differ on PSF characteristics? (2) Do students' PSFs interact with sex and prior academic achievement when predicting achievement in grades 11-12? Does the Matthew Effect (i.e., high-achieving students benefit more from higher PSFs) take place as PSFs interact with prior academic achievement?

### **Method**

To assess a wide range of students' PSFs and academic achievement, a longitudinal database maintained by ACT, Inc. was used in this study. This database was initially constructed for the purpose of development and validation of Engage® Grades 6-9, a self-reported measure of students' PSFs related to academic performance and persistence. In 2006, 24 middle schools in 13 districts throughout the Midwest and the South of the United States were recruited and agreed to administer Engage Grades 6-9 to all students in at least one grade level (in grades 6 through 9). The school-level sampling resulted in a sample of 4,660 students. These schools showed a wide range of student demographic and school attainment variability. Participant schools agreed to provide follow-up data as their students progressed through high school.

Where applicable, school districts with IRBs approved the study and obtained parental consent before data collection took place (ACT, 2011).

Since 2006, additional schools have administered Engage Grades 6-9 to their students and over 190,000 students from the United States have been assessed (ACT, 2016). The database used in this study was constructed by combining data from the initial sample of 4,600 with the additional data collected since.

### **Inclusion Criteria**

Students were included in the study based on the following criteria: (1) they took an assessment of psychosocial factors (ACT Engage Grades 6-9) while in grade 7, 8, or 9; (2) they took college readiness assessments in grade 7, 8 or 9 (ACT Explore) and later in grade 11 or 12 (The ACT test), and (3) students' responses in the psychosocial assessment were not flagged for insufficient variability or inconsistency for item response. Given these criteria, the final sample in this study consisted of 3,281 students from 50 schools. Most students took the psychosocial assessment in 8<sup>th</sup> grade (59%), while some took it in 9<sup>th</sup> grade (38%) or 7<sup>th</sup> grade (3%).

### **Sample Description**

Virtually all included students were between 12 and 15 years old (median=13) when they took the assessment of psychosocial factors. Approximately half of the students were female (55%) and predominantly Caucasian (43%), with the remaining racial/ethnic breakdown being African American (23%), Hispanic/Latino (22%), Multiracial (5%), American Indian/Alaskan Native (2%), Asian American/Pacific Islander (2%), and another race/ethnicity or preferred not to respond (3%). Relative to the United States population of 13-year-old children<sup>2</sup>, the sample includes larger concentrations of female (55% for sample vs. 49% for population) and African American (23% for sample vs. 15% for population) students, and similar concentration of Hispanic/Latino (22% for sample and population) students, and a smaller concentration of Caucasian (43% for sample, 56% for population) students.

We compared the sample's achievement test scores (ACT Explore Composite scores) to the U.S. 8<sup>th</sup> grade national averages<sup>3</sup>. The sample's statistics ( $n = 3,281$ ,  $M = 15.2$ ,  $SD = 3.0$ ) were very similar to the national statistics ( $M = 15.5$ ,  $SD = 3.3$ ), suggesting that the sample is similar to the U.S. population on academic achievement at baseline.

### **Instruments**

**Psychosocial factors.** ACT Engage Grades 6-9, a self-reported instrument measuring PSFs, was administered to the students in the classroom during class sessions. Within the aforementioned eligible sampled schools, students voluntarily completed the assessment, which takes 30 minutes to complete. The assessment includes nine scales that use 6-point Likert-type items (disagree a lot = 1 to agree a lot = 6); and one binary response scale (Orderly Conduct) (yes = 1 and no = 0). The ten scales show moderate to high internal reliabilities ( $\alpha = .81 - .90$ ,  $Mdn = .87$ ). Synthesizing theoretical and empirical evidence (including the findings from

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<sup>2</sup> Population estimates obtained from the U.S. Census Bureau April, 2010 Census.

<sup>3</sup> The characteristics of the national sample and norming process can be found in the ACT Explore technical manual (ACT, 2013).

exploratory and confirmatory factor analyses) (ACT, 2011; Casillas et al., 2012; Kuo, 2011), the psychosocial scales were grouped into three higher-order PSFs in this study: Motivation (including Academic Discipline, Commitment to School, and Optimism), Social Control (including Family Attitude toward Education and Family Involvement, Relationships with School Personnel, and School Safety Climate), and Self-regulation (including Managing Feelings, Orderly Conduct, and Thinking before Acting). Scale definitions, sample items and psychometric properties are presented in the Appendix (ACT, 2011). McAbee and Oswald (2013) argued that using aggregated scores is suggested if the research interest is to investigate the relationship between broad psychosocial measures and academic achievement, yet it may lead to some concerns when these scores are used for decision making purposes (e.g., college admission or personnel selection). Given the current research questions, the aggregated scores for each higher-order PSFs were used in this study.

**Academic achievement.** ACT Explore and the ACT test are standardized assessments of college readiness that include four multiple-choice subject tests: English, Mathematics, Reading, and Science. The tests were developed to assess students' academic achievement at the 8/9<sup>th</sup>- and 11/12<sup>th</sup>- grade levels<sup>4</sup>, respectively (ACT, 2013, 2014). The Explore test served as a baseline measure of academic achievement and the ACT test served as the endpoint. Because students could have taken the Explore test in grade 7, 8, or 9 and the ACT test in grade 11 or 12, there is variation across students in the number of months between tests (M=41.5, SD=8.6).

The Composite score for each assessment is the average score of the four aforementioned subjects. Explore is developed for 8<sup>th</sup> and 9<sup>th</sup> graders and focuses on the knowledge and skills that are usually learned by students in grade 8, while the ACT test is constructed to measure student knowledge and skills as the accumulative education outcomes of school experience. Using Composite scores may eliminate the ability to explore relationships for particular subject areas. However, these aggregated scores provide an overall perspective on academic achievement with good stability and consistency (Crone, Lang, Franklin, & Halbrook, 1994). To that end, the Composite scores of these two assessment programs were used in the present study as estimates of students' overall academic achievement at two points in time. Scale scores for Explore and the ACT test are comparable and could be approximately measured on the same scale to facilitate longitudinal comparisons (ACT, 2013, 2014).

### **Procedure**

Descriptive statistics and intercorrelations for PSFs (scale scores and domain scores) and academic achievement are summarized in Table 1. Since Engage scales include varying item numbers written in different formats, new scale scores on the common score range, ranging from 10 to 60, were generated through equations for linearly transforming raw mean scale scores. Afterwards, the three aggregate PSF scores, motivation, social control, and self-regulation, were

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<sup>4</sup> Both Explore and the ACT test measure academic skills necessary for education and work after high school. The test contents were constructed based on major subject areas. Reliability coefficients for Explore and the ACT Composite scores are .94 and .96 for national samples, respectively (ACT, 2013, 2014).

constructed by the unit weights method (Bobko, Roth, & Buster, 2007). According to the recommendations of Aiken and West (1991), the aggregate PSF scores and students' Explore and ACT Composite scores were transformed to z-scores for the following analyses. The dichotomous sex variable (males were coded as 1 and females were coded as 0) was not standardized. To avoiding unknown measurement effects by the outliers, those standardized PSF scores that are three standard deviations below the mean were dropped from further analyses. As a result, 1.3% ( $n = 43$ ), .5% ( $n = 16$ ), and .1% ( $n = 3$ ) of motivation, social control, and self-regulation scores were removed, respectively.

(INSERT TABLE 1 ABOUT HERE)

### **Data Analyses**

In response to research question 1, sex differences between male and female students in grades 7-9 were conducted by independent-samples t-tests for each PSF and the effect size, measured by Cohen's  $d$ , was estimated. Effect sizes of .2, .5, and .8 are denoted as "small", "medium", and "large", respectively based on Cohen's benchmarks (Cohen, 1988).

In response to the research question 2, the data were first plotted to visually assess the relationships between each PSF variable and later academic achievement. Second, to examine the relationships (e.g., linear vs quadratic) between PSF scores (independent variable) and later achievement (ACT Composite scores, dependent variable), multiple linear regression models, including sex and Explore Composite scores, were fit for each PSF without interaction terms. Then, a quadratic term for each PSF was added in the model to test for nonlinearity. We found that the quadratic terms in the regression models of motivation and social control were not significant, while the quadratic term in the self-regulation model was significant ( $R^2 = .6941$ ). But compared to the linear model ( $R^2 = .6935$ ), it only showed a .0006 increase in  $R^2$ . Based on the integration of theory, findings from earlier PSF studies, and preliminary analyses, multiple linear regression models were constructed to test the research hypotheses that each PSF moderates sex and prior academic achievement when predicting later achievement. Post-hoc probing of significant moderator effects was implemented. For example, when the significant effect of a three-way interaction term was found, Dawson and Richter's slope difference tests were applied in moderated multiple regression (Dawson & Richter, 2006) where the Bonferroni correction was estimated to maintain a family-wise alpha level of .05 (Miller, 1981).

## **Results**

### **Sex Differences in PSFs**

Table 2 indicates female students outperformed male students on motivation and self-regulation. Using Cohen's guidelines (Cohen, 1988), the effect size for sex differences were small for motivation ( $d = .20$ ), social control ( $d = .03$ ), and self-regulation ( $d = .24$ ).

(INSERT TABLE 2 ABOUT HERE)

### **Motivation and Academic Achievement**

Table 3 shows that the relationships between prior and later achievement as moderated by motivation. The three-way interaction term (sex x prior achievement x motivation) in predicting later achievement were not statistically significant. Parsimonious models with two-way

interaction terms were fit. The two-way interaction terms between prior achievement and motivation in predicting later achievement were statistically significant ( $B = .040, p < .001$ ). This suggests that the positive effect of motivation on later achievement increases with initial achievement. Similarly, the effect of initial achievement on later achievement increases with motivation. The moderation effects are illustrated in Figure 1. The difference in the slopes of the lines, by achievement, represents the moderation. For high-achieving students (i.e., scores in prior academic achievement are  $PR \geq 95$ ), the slope is slightly positive, whereas for low-achieving students (i.e., scores in prior academic achievement are  $PR \leq 5$ ), the slope is slightly negative. That is, as motivation increased, regardless of sex, the difference of later academic achievement generally widened. The results followed the pattern we expected. Additionally, motivation provided slight contribution beyond sex and prior achievement scores in predicting later achievement ( $\Delta R^2 = .003$ ).

(INSERT TABLE 3 ABOUT HERE)

(INSERT FIGURE 1 ABOUT HERE)

### **Social Control and Academic Achievement**

Table 4 shows the relationships between prior and later achievement as moderated by social control in predicting later achievement ( $B = .032, p < .01$ ) and the two-way moderation effects are illustrated in Figure 2. In the prediction of later achievement, regardless of sex, the findings suggest that high-achieving students benefit more from higher social control, whereas low-achieving students do not. Similar to findings in motivation, as social control increased, high achieving students experienced more growth in general than low-achieving students. Overall, social control provided incremental contribution beyond sex and prior achievement scores in predicting later achievement ( $\Delta R^2 = .005$ ).

(INSERT TABLE 4 ABOUT HERE)

(INSERT FIGURE 2 ABOUT HERE)

### **Self-regulation and Academic Achievement**

Table 5 shows the relationships between prior and later achievement as moderated by sex and self-regulation in predicting later achievement ( $B = -.061, p < .01$ ). Three-way moderation effects were found (see Figure 3). Compared to motivation and social control, self-regulation provided larger incremental contribution beyond sex and prior achievement scores in predicting later achievement ( $\Delta R^2 = .0076$ ). Table 6 shows that the slope of high-achieving female students significantly differed from high-achieving male students in predicting later achievement. In addition, the slopes of high- and low-achieving female students were significantly different. That is, as self-regulation increased, effects of prior achievement on later achievement increased for female students. To that end, among females, the Matthew Effect was evident.

(INSERT TABLE 5 ABOUT HERE)

(INSERT FIGURE 3 ABOUT HERE)

(INSERT TABLE 6 ABOUT HERE)

## **Discussion**

This four-year longitudinal study includes a large cohort of students who were assessed by a broad range of PSFs (motivation, social control, and self-regulation) using a self-reported psychosocial assessment and two college readiness assessments related to core academic subjects to estimate students' prior and later academic achievement. Given the large sample size, longitudinal research design, and robust assessments, the findings seem likely to generalize.

The results showed that all three PSFs showed limited incremental contribution (i.e., less than 1%) beyond sex and prior academic achievement. In predicting later achievement, positive effects of motivation and social control were observed for students with higher prior achievement, regardless of sex. However, positive effects of self-regulation were only observed for female students with higher prior achievement. Generally, the Matthew Effect was evident for all three PSFs. In particular, PSF effects were positive only for high-achieving students in the prior assessment. Based on the current findings, the relationships between each PSF and achievement, as well as relevant measurement issues are discussed below.

### **Motivation and Academic Achievement**

Females in grades 7-9 demonstrated greater motivation than males. However, regardless of sex, the high-achieving students seemed to gain more from being highly motivated than their low-achieving counterparts in terms of later academic achievement.

Consistent with earlier findings (e.g., Kuo, 2011; Zimmerman & Martinez-Pons, 1990), the present study shows that female students tend to demonstrate better self-regulatory mechanisms to achieve goals through motivational and volitional processes (e.g., conscientious behaviors, goal commitment, and optimism) than males. In addition, differences that appeared between the high- and low-achieving students were demonstrated. The widening achievement gap between high- and low-achieving students was shown as motivation increased. Specifically, the high-achieving students performed better as motivation increased.

Wood & Bandura (1989) argued that self-regulatory mechanisms include affective self-evaluation and perceived self-efficacy for goal setting and goal attainment. They posited that academically able students receive positive reinforcement for their previous work, become more motivated as a result of such reinforcement, and thus achieve more, thus creating a positive feedback loop of self-efficacy, which makes "the rich" (initial advantaged students) become richer (Zimmerman & Cleary, 2006). In contrast, self-efficacy perceptions of less academically able students may be due to the discouraging messages about their past achievement (Bandura & Locke, 2003; Usher & Pajares, 2006). Further, these students may avoid activities that lead to negative judgments of their competence in relation to other academically able students. Once they encounter academic difficulty, regardless of motivation, they tend to demonstrate helpless behaviors, and, in turn, perform worse at school at a later time (Dweck, 2000).

While a significant moderation effect was found in this study, motivation only contributed .3% of the variance beyond sex and prior achievement in later achievement. Prior studies have shown that motivation in the interplay of prior achievement has additional contribution in the prediction of later achievement (Hustinx et al., 2009; Kuo, 2011; Shiner, 2000; Steinmayr & Spinath, 2009). For instance, given a five-year longitudinal study using two large



middle school samples, the degree of the motivation effects show low but significant power to predict later education position beyond the prior achievement (Hustinx et al., 2009). Steinmayr and Spinath (2009) found that motivation variables provided significant slight incremental contribution (.4% of the variance) in later academic outcome beyond prior achievement and general intelligence given high school samples. Consistent with the earlier studies, the current findings presented slight, but significant incremental variance (less than 1%). Motivation appears to have small effects on changes in academic achievement, as measured by standardized tests.

Gagné and St Pére (2001) argued that motivation showed no predictive power in school achievement among the female students in a female high school. Some researchers argued that the findings in Gagné's work may be explained from measurement and research-design perspectives, such as restriction of range of the intrinsic motivation measure in the selected samples, appropriateness of assessment tools, domain-general versus domain-specific measure of intrinsic motivation, or limited study timeframe (e.g., Hustinx et al., 2009; Steinmayr & Spinath, 2009). The findings of the Matthew Effect for both males and females in the current study may provide another possible explanation for the disputed results: when examining female students without taking their achievement differences into consideration, the motivation effects on later achievement may have averaged to zero.

The jingle fallacy probably serves as another way to explain variation across studies documenting the effects of motivation. The jingle fallacy occurs because the term "motivation" may be used across studies but the constructs measured by the studies may be different (Pedhazur & Schmelkin, 1991). For instance, intrinsic and extrinsic motivation in Gagné's earlier work (Gagné & St Pére, 2001) was defined by Deci and Ryan's (1985) self-determination framework, whereas motivation measured in this study refers to self-regulatory mechanisms that help students to achieve academic success. Therefore, it is important to clarify the concept and definition of motivation when comparing its effects across different studies.

### **Social Control and Academic Achievement**

Family has significant influence on students' academic achievement (Barton & Coley, 2007; Fan & Chen, 2001; Hill & Tyson, 2009; Kim & Hill, 2015). In the school context, learning is considered as a social process where students collaborate with their peers and teachers to solve problems through accessible resources (Fiore et al., 2017; Zins, et al., 2007). In addition, when students perceive feeling of security in school, they tend to show better academic adjustment and achievement (Brand et al., 2003; Gietz & McIntosh, 2014; Gronna & Chin-Chance, 1999). Not surprisingly, how and what students perceive from their families and schools is related to their learning outcomes.

Unlike demonstrating greater motivation, females in grades 7-9 demonstrated no difference in social control compared to males. Findings of previous studies on sex differences in social control (e.g., family involvement and teacher-student relationships), are inconsistent in the prediction of academic achievement (e.g., Eamon, 2005; Hughes, Cavell, & Willson, 2001; Muller, 1998). For instance, studies showed that the relationships between parent involvement, teacher-student relationships and school achievement show no difference across sexes. However,

previous studies focused on the Latino samples show that female students tend to be more responsive to their parent involvement in learning activities than males, and succeed in school accordingly (e.g., Eamon, 2005). In addition, Hughes et al. (2001) found that female students more get along with teachers and other peers than male students, probably due to their cooperative and responsible behaviors.

The results in this study show that regardless of sex, the widening achievement gap appeared as the magnitude of social control increased. Specifically, high-achieving students performed better as social control increased, which is evidence of the Matthew Effect. Similar to motivation, the incremental contribution of social control was slight, accounting for only .5% of the variance in predicting later academic achievement. Thus, the findings suggest that the Matthew Effect related to social control and academic achievement is very small.

In a meta-analysis study, given middle school samples across 32 independent studies, Hill and Tyson (2009) found parental involvement was significantly correlated with achievement scores, though the relationship was small ( $r = .18$ ). Likewise, in this study, the correlation between social control and later academic achievement was .17 despite the fact that the social control measure used in this study included another construct in addition to familial engagement.

### **Self-regulation and Academic Achievement**

Self-regulation in this study was measured by aggregating scales that measure how well students manage their feelings, exhibit adequate conduct, and think things through before acting on ideas or emotions. Based on previous research, females are generally better able to manage emotions, regulate maladaptive behaviors, and control impulsiveness, compared to their male peers (Bjorklund & Kipp, 1996; Hosseini-Kamkar & Morton, 2014). Previous studies show that disruptive behavior disorders are three times more prevalent among males than females during childhood and many of these disorders persist into adolescence and adulthood, while the sex ratio for delinquency lessens in adolescence (Martel, 2013; Moffitt & Caspi, 2001). However, the relationships between emotional regulation and disruptive behavior disorders are unclear (Nolen-Hoeksema, 2012). This study found that adolescent females are better at regulating themselves emotionally and behaviorally than males ( $d = .24$ ).

Lozano, Gordillo and Pérez (2014) found that among college students, impulsivity is more strongly negatively related to academic achievement among students with higher intelligence. For less intelligent students, the relationship between impulsivity and academic achievement is trivial. In the current study, it was also found that the relationship between self-regulation and later achievement is stronger among high-achieving students in grades 7-9 than among their low-achieving peers.

The current findings show that high-achieving female students with high self-regulation had approximately equivalent (even higher) later achievement than high-achieving male students who also had high self-regulation, while this advantage is not found among low-achieving females with high self-regulation. Furthermore, when comparing high- and low-achieving female students, the academic achievement gap increases as self-regulation increased, while this effect was not found among their male counterparts. Along with evolutionary perspectives, the findings

may be also explained by the effects of self-efficacy for high-achieving female students (Bandura, 1977). Furthermore, these female students who gathered positive feedback based on their prior self-regulated feelings and behaviors related to past academic achievement are more likely to demonstrate similar regulated behaviors to achieve more. Again, the cyclical feedback loop seems to only exist in high-achieving female students. In addition, as in the studies conducted by Duckworth and her colleagues (Duckworth et al., 2015; Duckworth & Seligman, 2006), they argued that females outperform males academically in middle school because of greater self-control, rather than greater motivation. Consistent with Duckworth's study, the current study shows that sex interacts with self-regulation, rather than motivation, in predicting a measure of college readiness in grades 11 and 12 (see Table 4 and Table 6).

Sechrest (1963) stated that incremental validity should be described when the assessment is intended for applications and predictions, while Hunsley and Meyer (2003) argued that "interpretation of how meaningful it is to have an incremental validity value of a particular size can be rather contentious" (p.450). Aligned with previous findings (Casillas et al., 2012; Kuo, 2011; Steinmayr & Spinath, 2009), all PSFs were statistically significant, but only explained small increases in variance in later achievement ( $\Delta R^2 = .3\%$  to  $.8\%$ ). Nevertheless, educators should recognize that PSFs provide important information that can be used to better understand what and how students are at risk in school (Balfanz et al., 2007; NCSEAD, 2018; Rumberger & Lim, 2008). Furthermore, PSFs can be used as references to develop more effective intervention programs to improve educational outcomes (Durlak et al., 2011).

### **The Matthew Effect Evident in PSFs**

The Matthew Effect in American education has been generally discussed to examine cumulative effects coming from two potential sources: student and school characteristics (e.g., Kerckhoff & Glennie, 1999; Walberg & Tsai, 1983) or interventions (e.g., Ceci & Papierno, 2005). The findings from this study suggest that students' disparities in prior academic achievement and PSFs result in the dispersion of learning outcomes over time. Similarly, using a large national sample, Judge, Klinger, and Simon (2010) argued that individuals with higher cognitive abilities would earn higher salaries and job prestige compared to their counterparts with lower general cognitive abilities after leaving school. Further, these more cognitively able individuals demonstrate increased growth in salary and job prestige tend to increase their competencies through advanced education and professional training, and then seek out more complex jobs when compared to less cognitively able individuals. Stated differently, when compared to less-able individuals, more-able individuals are more skilled to access external resources to accumulate their human capital and thus achieve more gains. While considering the roles PSFs play in the Matthew Effect, the results of this study show that high-achieving students who are more likely to benefit from PSFs perform better on later assessments of academic achievement. It also complemented earlier work that people who give themselves better appraisals on core-evaluations (e.g., self-esteem, self-efficacy, locus of control, etc.) are more likely to attain successful jobs and careers partly because they are more inclined to pursue more in their professional development (Judge & Hurst, 2008).

Although it is beyond the scope of our study, it is worth noting that the Matthew Effect has received mixed findings when examining the impact of universal interventions. For example, some universal interventions designed to narrow the gap in skills may actually have the opposite effect and end up favoring advantaged students (e.g., Ceci & Papierno, 2005), whereas others (e.g., socio-cognitive interventions) may only benefit disadvantaged students (e.g., Schwartz et al., 2016). More details about the possible reasons for why the effects of these universal interventions failed to generalize to all students can be found in Schwartz et al. (2016).

### **Practical Implications**

#### **For Classroom Teachers**

The findings suggest that students' academic achievement in middle school provides a critical foundation for achieving college readiness, given the strong relationship between the ACT Explore and ACT Composite scores ( $r = .83$ ). Further, middle school students who have developed a solid knowledge base could benefit from PSFs to strengthen their academic preparation and success in high school. In other words, regardless of levels of motivation, social control, and self-regulation, low-achieving students (e.g.,  $PR \leq 5$  in this study) are less likely to achieve college readiness. Therefore, educators should note that students' PSFs show stronger effects on academic success in high school only when they have achieved a foundational level of knowledge and skills in middle school (cf. ACT, 2008).

#### **For Parents**

The family is America's smallest school (Barton & Coley, 2007). Parents play a vital role to promote K-12 student psychosocial learning and academic success though the parental practices may differ due to the culture differences (Hill & Tyson, 2009; Kim & Hill, 2015; Roy & Giraldo-Garcia, 2018). Similar to the aforementioned implications to classroom teachers, parents should recognize that positive attitude toward education and involvement in education are beneficial for college readiness only when children have rigorous foundational knowledge and skills in middle school. Further, it is recommended that in collaboration with classroom teachers, parents are suggested to build school-family partnerships with effective strategies to promote children's psychosocial and academic growth<sup>5</sup> (for details, see Albright, Weissberg, & Dusenbury, 2011).

#### **For Educational Policymakers**

President Obama stated, "And so the question is whether all of us – as citizens, and as parents – are willing to do what's necessary to give every child a chance to succeed" (White House, 2011). Research from national and international standardized testing programs has shown that many American middle school students are being left behind, and further, are off-track for college readiness (ACT, 2008; Giacomo, Fishbein, & Buckley, 2013; Royster, Gross, & Hochbein, 2015; Schmeiser, 2011). In addition to ensuring rigorous and high-quality curriculum in middle school, some states started to combine psychosocial learning into curricula where nonacademic skills are taught and measured with the goal of improving various educational

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<sup>5</sup> More parent resources for psychosocial learning could be found at Collaborative for Academic, Social, and Emotional Learning: <https://casel.org/parent-resources/>

outcomes (Dusenbury, Weissberg, Goren, & Domitrovich, 2014; Sparks, 2011). Further, policymakers have recently recognized that both cognitive and psychosocial skills matter when measuring the effects of educational accountability. In fact, the *Every Student Succeeds Act* requires each state to measure at least one nonacademic factor, such as student motivation, when tracking schools' performance (Malin, Bragg, & Hackmann, 2017). Thus, this study adds to the growing discussion on how to leverage efforts to develop accountability systems that integrate psychosocial learning, such as the development of standards, assessments, and curriculum focused on PSFs, as well as a more comprehensive approach that integrates core academic knowledge and skills, PSF/behavioral skills, and career navigation in K-12 programs (Balfanz et al., 2007; Camara, O'Connor, Mattern, & Hanson, 2015; Dusenbury et al., 2014; Nagaoka et al., 2015; Rumberger & Lim, 2008; Sparks, 2011).

### **Limitations and Future Research**

#### **Limitations**

Three limitations of the study are noted. First, this study examined the effects of three broad PSFs - motivation, social control, and self-regulation. By not examining more specific constructs, such as those measured by the individual psychosocial scales, we may less likely to detect differential effects of narrower characteristics and behaviors. When designing educational programs for at-risk or high-achieving students, measures of specific constructs (e.g., Academic Discipline) under each broad PSF may be more relevant and informative for the intended use of helping students to develop their skills.

Second, a standardized assessment of college readiness was used as the criterion in this study (i.e., the ACT test), while grade point average (GPA) was used in previous psychosocial studies (e.g., Robbins et al., 2004; Poropat, 2009). PSFs contributed relatively larger incremental variance in college GPA beyond high school GPA and standardized college readiness assessments (Robbins et al., 2006). Compared to standardized college readiness assessments, previous middle school studies showed that the relationship between PSFs and GPA are stronger (ACT, 2011; Duckworth & Seligman, 2006; Lounsbury et al., 2003). It seems that the findings of the magnitude of the relationship between PSFs and GPA may not be parallel to standardized assessments of college readiness. One possible reason is that, different from a standardized assessment of college readiness which is only used to assess students' academic success, GPA is a general index to estimate students' academic *and* non-academic performance. PSFs used in current study are broad constructs. For example, highly-motivated students may have strong motivation on extracurricular activities and lack interest in academic learning. Consequently, PSFs are more correlated to GPA than scores of college readiness assessments which only measure academic achievement. In addition to assessments of college readiness or GPA, instructionally sensitive assessments might better reflect the effects of PSFs. These assessments are developed to differentiate students who received quality instructional opportunities from those who did not receive these opportunities (Ing, 2018; Polikoff, 2010).

Third, the study used listwise deletion to address missing data. This comes with the risk that, when data are not missing at random, listwise deletion can cause biased results (see Little, 1995).

Last but not least, the current study did not include family background variables (e.g., ethnicity, social economic status, etc.) in the statistical models, which may introduce potential confounds of the predictors of later achievement.

### **Future Research**

The students' PSFs in this study were measured through self-reported assessments where some measurement concerns, such as referencing errors, social desirability, and fakability, have been discussed in earlier studies (Duckworth & Yeager, 2015; Kyllonen, 2005; Kyllonen, Lipnevich, Burrus, & Roberts, 2014; Paulhus, 1984). In addition, when students respond to these self-reported assessments, they may be involved in either self-deception or impression management (Paulhus, 1984). Students involving in self-deception actually believe their positive ratings, while students involving in impression management display themselves positively to other peers through their self-ratings (Fisher & Katz, 2000; Paulhus, 1984). In this study, low-achieving students may be more likely to rate themselves highly on PSFs due to either self-deception or impression management. Another possible weakness of self-reported assessments is that students may rate their behaviors by comparing themselves to their peers (Kyllonen, 2005). Thus, it is likely that low-achieving students report positive PSFs when referencing to their similarly-abled peers. This is one reason why psychosocial assessments are often used for low-stakes, rather than prediction and selection purposes.

Along with psychosocial factors, students' school behavior, such as attendance and homework completion are helpful in predicting academic success and for planning possible educational interventions (Balfanz et al., 2007; Casillas et al., 2012; Yen et al., 2004). Given the limitations of self-reported psychosocial assessments, others' ratings based on students' actual behavior (e.g., behavioral data from school records, teachers, counselors, or peers) can minimize possible measurement problems and be used for predicting achievement in future studies (Kyllonen, 2005; Kyllonen et al., 2014; Poropat, 2014a; Vazire & Carlson, 2011; Wagerman & Funder, 2007). For example, studies have shown that teacher-reported behavioral scales and peer nominations can serve as another useful and accurate source of information (Oh, Wang, & Mount, 2011; Poropat, 2014b). Although teacher-reported behavioral measures (or other ratings) are promising, it is not yet fully understood how practical and scalable it would be to use both self- and teacher-reported psychosocial measures in the classroom. Specifically, it is unclear how to compare, integrate, and interpret the findings from these two types of measures. Additional research in applied settings can provide a better understanding of the utility of combining self- and teacher-reported PSF assessments in educational settings.

Studies of narrow psychosocial measures are recommended. Past research suggest that more narrow psychosocial characteristics that manifest in learning behaviors are more likely to be observed and more likely to be malleable, and thus may better serve as predictive factors of educational success (e.g., Casillas, Way, & Burrus, 2015; Peterson et al., 2006). For example,

Lounsbury et al. (2003) found that narrow psychosocial characteristics can also show significant incremental contribution when predicting students' academic outcomes. Given motivational constructs, Zimmerman (2008) argued that sustained effort are one of the most effective predictors of homework completion and goal achieving. Consequently, it is reasonable to hypothesize that academic discipline, a scale under the motivation domain in this study, may serve a more noticeable role in predicting college readiness in high school, whereas other two PSFs, commitment to school and optimism, may have relatively small contribution for later achievement. Likewise, within social control, it seems justified to extract family engagement from other social control variables due to the evidenced predictive power of parental involvement for later academic outcomes (e.g. Hill & Tyson, 2009; Kim & Hill, 2015). Therefore, examining the differential roles of individual narrow psychosocial constructs in predicting academic success would be a promising direction of future research.

Given that previous research has found consistent sex differences in variables that relate to motivation, such as conscientiousness and self-discipline (see Soto, John, Gosling & Potter, 2011), we opted to test sex as a moderator in this study. While including prior achievement (Explore scores) greatly reduces social economic status and race differences in later achievement (ACT scores), additional sociodemographic subgroups and indicators, as well as the inclusion of additional covariates would be good topics of exploration in future research.

### **Conclusions**

Middle school is a key transition period for the development of behaviors that facilitate later high school and postsecondary academic success (ACT, 2008). Compared to earlier studies, the contribution of the current work is to explain how student PSFs interact with middle school academic achievement and sex when predicting academic achievement in high school. In particular, the Matthew Effect was found in general with sex differences being present in self-regulation. It is hoped that the findings will provide educators a better understanding about the significance of PSFs in middle school to help students succeed in high school.

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(INSERT APPENDIX ABOUT HERE)

Table 1

*Descriptive statistics and Intercorrelations for Scores on Psychosocial Scales, PSFs, and Academic Achievement*

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Academic Discipline	48.61	8.00	-													
2. Commitment to School	56.92	4.77	.48	-												
3. Optimism	49.27	8.12	.50	.50	-											
4. Family Attitude toward Education	55.84	5.39	.45	.69	.46	-										
5. Family Involvement	46.88	9.33	.52	.43	.54	.58	-									
6. Relationships with School Personnel	39.22	9.53	.44	.30	.45	.29	.50	-								
7. School Safety Climate	38.89	10.02	.33	.17	.28	.17	.30	.53	-							
8. Managing Feelings	39.46	10.96	.53	.25	.36	.24	.38	.44	.41	-						
9. Orderly Conduct	45.97	13.16	.52	.22	.25	.21	.27	.33	.34	.65	-					
10. Thinking before Acting	40.31	8.56	.56	.30	.43	.26	.39	.37	.25	.61	.53	-				
11. PSF-Motivation	51.60	5.70	.84	.74	.85	.62	.62	.51	.34	.49	.42	.55	-			
12. PSF-Social Control	45.21	6.41	.58	.48	.57	.59	.79	.82	.73	.51	.40	.43	.68	-		
13. PSF-Self-regulation	41.92	9.36	.62	.29	.38	.27	.39	.44	.40	.88	.88	.79	.56	.52	-	
14. Explore Composite	15.04	2.95	.19	.16	.09	.17	.08	.07	.11	.18	.22	.09	.18	.13	.20	-
15. ACT Composite	18.73	4.56	.21	.13	.07	.16	.11	.08	.16	.21	.23	.09	.17	.17	.22	.83

*Note.*  $N = 3,281$ . All correlations are significant ( $p < .001$ ).

Table 2

*Comparison of PSFs across Male and Female Students in Grades 7-9*

PSF	Females	Males	<i>t</i>	<i>df</i>	Cohen's <i>d</i>
Motivation	52.34	51.31	5.57***	3208	.20
Female ( <i>n</i> = 1,779)	(5.10)	(5.31)			
Male ( <i>n</i> = 1,431)					
Social Control	45.41	45.23	.80	3234	.03
Female ( <i>n</i> = 1,786)	(6.37)	(6.07)			
Male ( <i>n</i> = 1,450)					
Self-Regulation	42.98	40.71	6.97***	3246	.24
Female ( <i>n</i> = 1,793)	(9.45)	(9.01)			
Male ( <i>n</i> = 1,455)					

*Note.* Range *N* = 3,210 to 3,248. Standard deviations appear in parentheses below means.

\*\*\*  $p < .001$ .

Table 3

*Relationships Between Prior and Later Academic Achievement as Moderated by Sex and Motivation*

	Later Achievement			
	Model 1		Model 2	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Intercept	-.059***	.013	-.072***	.013
Sex	.129***	.020	.138***	.020
Explore	.845***	.014	.831***	.014
Sex × Explore	-.024	.020	-.007	.020
Motivation			.058***	.015
Sex × Motivation			-.043	.022
Explore × Motivation			.040***	.010
Model $R^2$	.6896		.6926	
$\Delta R^2$			.003	

*Note.*  $n = 3,210$ . Females = 0 and Males = 1;  $\Delta R^2$  is the difference between  $R^2$  in model 1 and model 2. Explore is a standardized assessment of college readiness to measure students' knowledge and skills learned in grade 8.

\*\*\*  $p < .001$  (two-tailed).

Table 4

*Relationships Between Prior and Later Academic Achievement as Moderated by Sex and Social Control*

	Later Achievement			
	Model 1		Model 2	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Intercept	-.058***	.013	-.065***	.013
Sex	.129***	.020	.133***	.020
Explore	.844***	.014	.829***	.014
Sex × Explore	-.026	.020	-.015	.020
Social Control			.081***	.013
Sex × Social Control			-.051*	.020
Explore × Social Control			.032**	.010
Model <i>R</i> <sup>2</sup>	.6895		.6944	
$\Delta R^2$			.0049	

*Note.* *N* = 3,236. Females = 0 and Males = 1;  $\Delta R^2$  is the difference between *R*<sup>2</sup> in model 1 and model 2. Explore is a standardized assessment of college readiness to measure students' knowledge and skills learned in grade 8.

\* *p* < .05, \*\* *p* < .01, \*\*\* *p* < .001

Table 5

*Relationships Between Prior and Later Academic Achievement as Moderated by Sex and Self-regulation*

	Later Achievement			
	Model 1		Model 2	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Intercept	-.057***	.013	-.085***	.013
Sex	.129***	.020	.160***	.020
Explore	.844***	.013	.801***	.014
Sex × Explore	-.027	.020	.005	.020
Self-regulation			.086***	.013
Sex × Self-regulation			-.043*	.020
Explore × Self-regulation			.078***	.014
Sex × Explore × Self-regulation			-.061**	.020
Model $R^2$	.6896		.6972	
$\Delta R^2$			.0076	

*Note.*  $N = 3,248$ . Females = 0 and Males = 1;  $\Delta R^2$  is the difference between  $R^2$  in model 1 and model 2. Explore is a standardized assessment of college readiness to measure students' knowledge and skills learned in grade 8.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



Table 6

*Tests of Simple Slopes of Later Academic Achievement on Self-regulation*

Group	Slope Differences	$SE_{contrast}$	$t$	Bonferroni's $p$
High-achieving Male vs High-achieving Female	-.72	.20	-3.68*	< .001
Low-achieving Male vs Low-achieving Female	.21	.16	1.31	.048
High-achieving Male vs Low-achieving Male	.26	.22	1.14	.063
High-achieving Female vs Low-achieving Female	1.18	.20	5.78*	< .001

*Note.*  $N = 3,248$ . Low-achieving and high-achieving students refer to students whose scores in prior academic achievement are percentile rank  $\leq 5$  (bottom 6.25% of the students) and percentile rank  $\geq 95$  (top 5% of the students), respectively. Specifically, the sample sizes for high-, average-, and low-achieving males are 75, 1270, and 110, while the sample sizes for high-, average-, and low-achieving females are 88, 1615, and 90, respectively. The Bonferroni correction was applied.

\*  $p < .013$

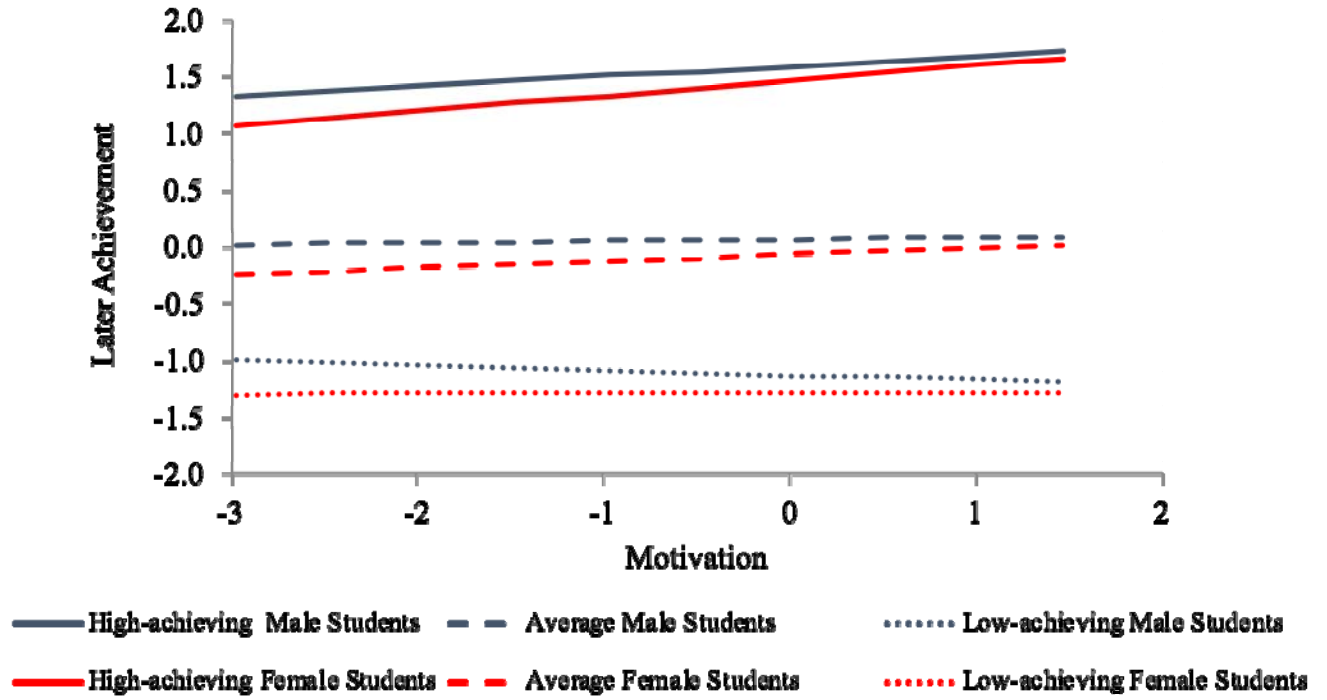


Figure 1. Relationships between motivation and later academic achievement at low, average, and high scores for prior academic achievement and both sexes. The sample sizes for high-, average-, and low-achieving males are 74, 1252, and 105, while the sample sizes for high-, average-, and low-achieving females are 88, 1605, and 86, respectively.

*Figure 2.* Relationships between social control and later academic achievement at low, average, and high scores in prior academic achievement and both sexes. The sample sizes for high-, average-, and low-achieving males are 75, 1265, and 110, while the sample sizes for high-, average-, and low-achieving females are 87, 1610, and 89, respectively.

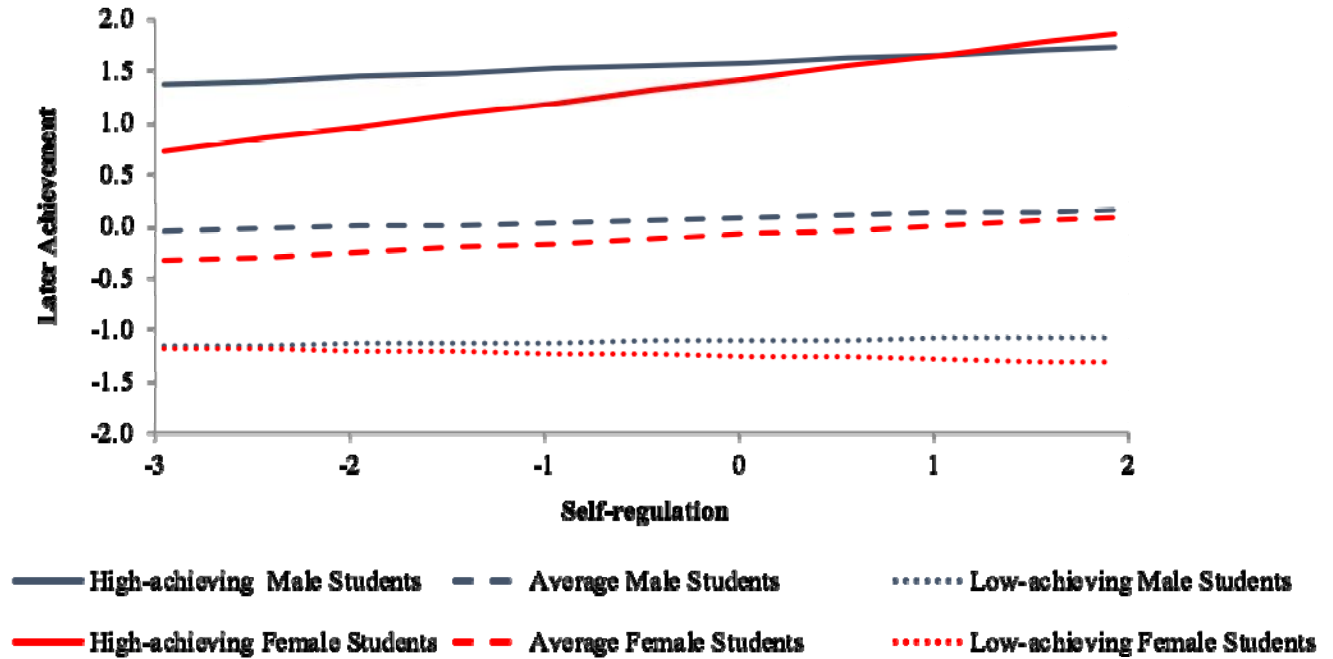


Figure 3. Relationships between self-regulation and later academic achievement at low, average, and high scores in prior academic achievement and both sexes. The sample sizes for high-, average-, and low-achieving males are 75, 1270, and 110, while the sample sizes for high-, average-, and low-achieving females are 88, 1615, and 90, respectively.

Appendix

Psychosocial Assessment Factors, Scales, Definitions, and Sample Items.

Factor	Scale	Definition	Sample items	# of items	$\alpha$ -scale	$\alpha$ -factor
Motivation	Academic Discipline	Degree to which a student is hardworking and conscientious as evidenced by the amount of effort invested into completing schoolwork.	1. I turn in my assignments on time. 2. I'm usually prepared for class.	11	.90	.93
	Commitment to School	Commitment to stay in high school and obtain a diploma.	1. I am committed to graduating from high school. 2. A high school diploma is important for getting ahead in life.	10	.85	
	Optimism	Having a hopeful outlook about the future in spite of difficulties or challenges.	1. I am confident that everything will turn out all right. 2. I look for the bright side of things.	10	.88	
Social Control	Family Attitude toward Education	Positive family attitude regarding the value of education.	1. My family supports my efforts in school. 2. Education is important to my family.	10	.84	.92
	Family Involvement	Family involvement in a student's school life and activities.	1. My family tries hard to be involved in my school life. 2. I talk to my family about school accomplishments.	9	.87	
	Relationships with School Personnel	The extent to which students relate to school personnel as part of their connection to school.	1. Adults at my school understand point of view. 2. If I was in trouble, adults at my school would be there to help.	12	.89	

	School Safety Climate	School qualities related to student's perception of security at school.	1. I feel safe at school. 2. Students at my school don't get in trouble with the law.	11	.81	
Self-regulation	Managing Feelings	Tendency to manage duration and intensity of negative feelings, and to find appropriate ways to express these feelings.	1. I would walk away if someone wanted to fight me. 2. I fight back when someone makes me mad (reverse-keyed).	12	.89	.92
	Orderly Conduct	Tendency to behave appropriately in class and avoid disciplinary action.	1. I joke around or make fun of others during class (reverse-keyed). 2. I have been sent to the principal's office for misbehaving (reverse-keyed).	9	.80	
	Thinking before Acting	Tendency to think about the consequences of one's actions before acting.	1. I think about what might happen before I act. 2. I think about what I say before I say it.	12	.86	

*Note.* Adapted from "ACT ENGAGE Grades 6-9 User's Guide," by ACT, 2011. Copyright 2011 by ACT.