

Grit Fosters Academic Behaviors in Latinx Youth: A Noncognitive Pathway Model

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Abstract

Latinx youth are highly underrepresented in higher education (Pew Research, 2016). Evidence shows inadequate academic preparation prevents Latinx youth from attending college (Fry, 2006). Positive academic behaviors and noncognitive factors (e.g., belief in one's own abilities, passion to pursue long term goals, are critical to academic achievement, however, it is unclear how these factors manifest in Latinx youth and which factors are most important. Through the use of a longitudinal structural equation model, this study tested a good-fitting model explaining noncognitive pathways to high school academic achievement for Latinx youth. Results of the study suggest that academic achievement in junior high school fosters the development of grit and a growth mindset, which in turn contribute to academic behaviors in high school. Grit, in particular, explained a significant portion (75%) of the variance in academic behaviors. Academic behaviors then partially mediate junior high school and high school academic achievement. Implications of this model for basic research and college readiness interventions are discussed.

Keywords: academic achievement, grit, growth mindset, academic behaviors, Latinx

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In the United States, Latinxs are vastly underrepresented in higher education. In 2014, college aged (18-24 years) Latinx youth accounted for 32% of the total college aged youth in the United States (United States Census Bureau), however, only 7% of Latinx youth attended a four-year institution (Pew Research, 2016). The college dropout rate for Latinx students is also extraordinarily high; a longitudinal study found 81% of Latinx students dropped out of college before graduation (Dunlop Velez, 2014). Latinxs continue to lag behind other ethnic groups in receiving four-year degrees (Pew Research, 2016); in 2014, only 15% of the Latinx population held a bachelor's degree (or higher) compared to 22% of African Americans, 41% of Caucasians, and 63% of Asians (NCES, 2015). These rates are particularly alarming because college degrees are an important asset in today's society: eight out of 10 new jobs will likely hire individuals with a college degree (Obama, 2010). A college degree is not only associated with better employment opportunities, but also with financial stability and overall physical health (Pew Research, 2012; Geronimus, Hicken, Keane & Bound, 2006; Campbell, 1981). Because Latinx youth are significantly underrepresented in higher education today, it is critical to study ways to increase the college enrollment and attainment rate of this group, who represent 18% of the US population (Pew Research, 2016). To better understand the developmental pathways underlying Latinxs college attainment this study tests a model relating psychological skills and strategies, also known as noncognitive factors (e.g., grit, growth mindset, and academic behaviors), to early academic achievement in a Latinx sample.

While Latinx youth experience a range of barriers to college enrollment (see Zarate & Burciaga, 2010; Flint, 1992; Ornelas, 2002, Solorzano & Ornelas, 2002), lack of adequate academic preparation is the most salient (Fry, 2004). Latinx youth tend to score lower on both

junior high and high school academic achievement tests (Ainsworth, 2002; Roscigno, 2000).

This is a significant obstacle for Latinx youth because academic preparation plays a significant role in determining college admission and retention (California Department of Education, 2006). Enrollment and success in academically rigorous courses is also critical for college admission and bare even more weight for minority youth (ACT, 2004; Adelman, 1999; Braddock, 1990; Gamoran, 1987; Oakes, 1987), yet, minority youth are disproportionately enrolled in classes that are taught with less rigor (Braddock, 1990; Berkner & Chavez, 1997; Gamoran, 1987; Oakes, 1985; Oakes & Lipton, 1992; Thomas, 2000). Such that, significantly fewer Latinx youth enroll in high-level mathematic courses in high school (12%) than Caucasian youth (34%; U.S. Department of Education, 2005). Academic preparation, in terms of GPA and academic rigor, significantly determines one's likelihood of being enrolled in a 4-year university (SFUSD, 2018).

Evidence suggests academic achievement must be fostered in junior high school for youth to achieve the rigorous academic preparation necessary for college admission. Academic achievement in junior high school is a significant predictor of high school academic achievement across all populations (Balfanz, Herzog & Mac Iver, 2007; Bowers, 2010; Castillas et al., 2012). Longitudinal studies have shown that junior high school course performance was positively related to both high school GPA ($r = .64$) and high school graduation rates ($r = .62$; Castillas et al., 2012; Mac Iver, 2010). The California Department of Education similarly found that 7th grade GPA and proficiency levels on California standardized tests strongly predicted high school academic achievement (PolicyBrief, 2008). This strong correlation between junior high school and high school academic achievement means low-achieving junior high school students are at particular risk for later academic failure. One study found students (37%) who received 2 or more failing grades in 7th grade dropped out of high school a few years later (PolicyBrief, 2008).

The relationship between junior high and high school achievement has gained such wide recognition that researchers and educators view low academic performance in junior high school as an “early warning sign” to later academic failure (Bowers, 2010). Thus, to increase representation of Latinx youth in higher education it is critical to identify ways bolster academic preparation for Latinx youth in their academic careers.

Empirical Evidence Supporting Noncognitive Pathways

One way to explain the persistence of junior high school academic achievement to high school academic achievement is through Farrington and colleagues’ (2012) theoretical noncognitive pathway model. Noncognitive factors (e.g., grit, growth mindset, and academic behaviors) are defined as motivational skills or strategies not measured directly by cognitive educational tests (Farrington et al., 2012; Dweck, Walton, & Cohen, 2011). The model proposes that background characteristics, like previous academic achievement, influence the development of academic mindsets (beliefs about academic ability). In particular, having a growth mindset (e.g., a belief that intelligence is malleable) is the foundation for the development of other noncognitive factors (e.g., grit, academic behaviors). When students believe their achievement is malleable, they develop the passion and stamina necessary to pursue long-term goals (e.g., grit). Assuming that their passion and stamina is directed toward education, students’ grit then can lead to academic behaviors such as studying, time management, and academic engagement. Finally, engaging in these kinds of positive academic behaviors is likely to lead to higher test scores, grades, and GPA.

Positive academic behaviors (e.g., positive study habits, completing homework on time) are seen as predecessors to academic achievement across all samples (Conrad, 2006; Farrington et al., 2012). Evidence suggests academic behaviors are positively correlated to academic

achievement in high school (Conrad, 2006; Cooper, 2006; Allensworth & Easton, 2007). For example, a meta-analysis demonstrated that a range of academic behaviors across a variety of contexts had significantly positive relationships with overall academic achievement (Cooper, 2006). Similarly, the absence of positive academic behaviors accounted for 61% of the variance in 9th grade academic failures (Allensworth & Easton, 2007). These studies demonstrate that youth engagement in positive academic behaviors strongly predict their academic achievement. Therefore, it is essential to identify factors to target through intervention that have the potential to increase academic behaviors. A growing body of research suggests growth mindset may be a primary contributing factor to academic behaviors.

Farrington and colleagues (2012) assert that growth mindset acts as a mediator between junior high school academic achievement and academic behaviors in high school. Dweck defines growth mindset as the belief that intelligence is malleable and comes with effort whereas a fixed mindset is the belief that intelligence cannot be changed and is a reflection of personal attributes (Dweck, 2006). Research has shown youth who have the mindset that their intelligence is malleable are more likely to engage in positive academic behaviors and earn a higher GPA (Curry, Elliot, Da Fonsca, & Moller, 2006; Dweck & Leggett, 1988). In contrast, youth who have a fixed mindset tend not to engage in academic behaviors when met with an academic challenge (e.g., failing a test etc.; Kelly, 1973; Weiner, 1986; Visoel & Austin, 1995). These studies suggest youths' belief about their own intelligence and academic ability has a significant impact on how youth engage in academic work.

In addition, research suggests grit significantly contributes to the development of academic behaviors (Duckworth & Seligman, 2005; Duckworth & Quinn, 2009). Grit is defined as the perseverance to achieve long term goals (Duckworth et al., 2007). The passion and

stamina to pursue long term goals is viewed as a primary contributing factor to the development of academic behaviors because grit is positively correlated with academic achievement at large (Duckworth & Seligman, 2005; Duckworth & Quinn, 2009). When researchers analyzed the relationship between grit, SAT Scores (used as an indicator of IQ), and academic achievement (GPA), grit remained a significant predictor of GPA ($\beta = .34$) when SAT scores were controlled for (Duckworth et al., 2007). This study along with several others suggest grit is strongly influences academic achievement (Duckworth & Seligman, 2005; Duckworth & Quinn, 2009; Duckworth et al., 2007). While substantial evidence supports grit and growth mindset as important contributors to academic behaviors, these relationships have yet to be empirically tested together in a model in a Latinx sample. Therefore, there must be empirical testing of the relationships between growth mindset, grit, and academic behaviors in a primarily Latinx sample to determine whether the noncognitive mechanism is similar or stronger for low-income, academically struggling, Latinx youth than populations that have gained the most amount of attention in noncognitive research (middle-income Caucasian youth).

Noncognitive Pathways in Latinx Youth

Some studies suggest the relationship between growth mindset and academic behaviors may be stronger for academically struggling, low-income, Latinx youth than middle-income Caucasian youth. A recent meta-analysis suggests that growth mindset interventions for youth who had low-academic achievement demonstrated greater effect sizes than interventions for youth who had middle to high academic achievement scores (e.g., low proficiency scores, low GPA, at-risk for academic failure; Sisk et al., 2018). These findings posit that growth mindset may be more important for youth who have low-academic achievement. For example, Blackwell and colleagues (2007) implemented a growth mindset intervention to low-academic achieving

minority youth and found youth who received the intervention performed better in math compared to similar youth who did not receive the intervention. These results suggest that increasing growth mindset in low-achieving minority youth may result in higher grades (Blackwell et al., 2007). In contrast, another study found little differences in academic achievement after implementing a growth mindset intervention with a predominately Caucasian, middle to high income, sample (Holden, Moreau, Greene, & Conway, 2016). Taken together, these studies suggest growth-mindset interventions may be more important for low-income, academically struggling, Latinx youth (and other low-income ethnic minority groups) than for middle-income Caucasian youth. In addition to having a growth mindset, grit poses as an important factor that may foster academic behaviors in Latinx youth.

Out of the noncognitive factors in the Farrington model, grit may be the most important noncognitive factor to foster among Latinx youth because of the significant number of academic barriers Latinx youth confront. Although it has yet to be empirically tested, passion and perseverance towards an academic goal (e.g., college admission) may protect Latinx youth from the multitude of academic barriers they experience and allow them to academically succeed. Given low-income Latinx youth are one of the minority groups at greatest risk of academic failure in junior high school (U.S. Department of Education, 2003; Ainsworth, 2002), it is a significant challenge to improve their high school grades to be at a competitive level for college admission. Therefore, developing the stamina to combat academic hardship may be more important to foster in this population than others.

Despite the substantial amount of research which support the importance of noncognitive factors, important gaps in this body of literature remain. Little empirical evidence demonstrates how noncognitive factors manifest in Latinx youth, specifically, and how noncognitive pathways

impact their academic achievement. To date, the Farrington model has yet to be applied to explain academic achievement in Latinx youth. This is critical not only because Latinx youth are at-risk for academic failure (Bowers, 2010), but also because systems of racial oppression (e.g. classroom microaggressions, underfunding of schools with high minority populations, school to prison pipeline, segregated school systems) impact low-income Latinx youth in a way that middle-income Caucasian youth do not experience (García Coll et al., 1996; Ginorio & Huston, 2000; Moreno, 1999; Valencia, 2000) and therefore there is a moral imperative to understand pathways of potential intervention. Research designed to better understand how noncognitive factors function in Latinx youth is a necessary first step in addressing Latinxs significant lack of representation in higher education. Thus, the purpose of the present study was to longitudinally examine and validate noncognitive pathways of academic achievement in a Latinx sample.

The Present Study

The aim of the present study was to test a theoretically based model to explain the noncognitive pathways between junior high school academic achievement and high school academic achievement in a Latinx sample. Figure 1, provides a visual demonstration of the hypothesized structural equation model. It was hypothesized that Wave 1 data, 7th and 8th grade academic achievement, will significantly contribute to the development of growth mindset, grit, and academic behaviors, in Wave 2 as well as academic achievement in Wave 3. In Wave 2, it was hypothesized that growth mindset and grit will positively explain the variance in academic behaviors. Lastly, it was hypothesized that academic behaviors would explain a significant amount of variance in later high school academic achievement (Wave 3).

Hypothesis (1):

- (a) The relationship between Latinxs' junior high school and high school academic achievement would be partially mediated by academic behaviors in high school, such that higher academic achievement in junior high would be associated with higher levels of engagement in academic behaviors in high school and higher academic achievement in high school.
- (b) The relationship between Latinxs' junior high school academic achievement and academic behaviors in high school would be mediated by growth mindset, such that higher academic achievement in junior high would be associated with higher levels of growth mindset and higher levels of academic behaviors in high school.
- (b) The relationship between Latinxs' junior high school academic achievement and academic behaviors in high school would be strongly mediated by grit, such that higher academic achievement in junior high would be associated with higher levels of grit and higher levels of academic behaviors in high school.

Method

Participants

This study used Wave 1, Wave 2, and Wave 3 data from a longitudinal evaluation conducted by the Claremont Evaluation Center. In total, the sample consisted of 1,060 adolescents across all waves. Youth were only included in the study who were present at all three data collection time points. Of this sample, 616 were female and 444 were male, 74% received free or reduced lunch, and 96% identified as Latinx. At Wave 1, the youth were in junior high school (7th or 8th grade) and were 11 to 13 years old ($M_{age} = 12$ years). At Wave 2, adolescents were either in 10th or 11th grade in high school and were 14 to 16 years old ($M_{age} = 15$ years).

Lastly, at Wave 3 adolescents were in either 11th or 12th grade in high school and were 16-18 years old ($M_{age} = 17$ years).

Procedure

Participants, recruited in 2014 studied until 2017, came from seven high schools in southern California. Participants' primary caregiver provided informed consent and the adolescents provided assent. Data for Waves 1 and 3 were collected directly from the school district, and data for Wave 2 were generated by participants who completed surveys in 2016. Surveys were administered either during an elective class period or through an after-school program.

Measures

Wave 1

Academic Achievement Indicators. Three indicators were used to assess adolescent's academic achievement at Wave 1. To determine English proficiency levels, California Standardized testing scores were used (1) *far below basic* to (5) *advanced*. Math proficiency levels were also measured using the California Standardized test. Lastly, youth's earliest (7th or 8th grade) cumulative GPA was collected. All three indicators of academic achievement were provided by the school district.

Wave 2

Growth Mindset. Growth mindset was measured by the academic efficacy subscale from the *Patterns of Adaptive Learning Scales* (PALS) (Midgley et al., 2000), which consists of 5 items students score on a scale of (1) *strongly disagree* to (5) *strongly agree*. Items include, "I can do almost all the work in my classes if I don't give up" (see Appendix A). The one study that tested growth mindset with an adequate sample of Latinx youth (35% of the sample)

demonstrated an internal consistency with a Cronbach's alpha of .82 (Conley, 2011). The scale was found to be internally consistent in this sample, with Cronbach's alpha of .88.

Grit. Grit was measured using the *Child Adapted Grit Scale* (Duckworth & Quinn, 2009; Duckworth, Peterson, Matthews, & Kelly, 2007). Youth were asked to respond to 5 items on a scale of (1) *Very much like me* to (5) *not at all like me* questions similar to, "I often set a goal but later choose to pursue a different one" (Appendix B). In previous studies internal consistency was high with a Cronbach's alpha ranged from .60 to .82 (Duckworth et al., 2007; Duckworth et al., 2011), and the one study that used the Child Adapted Grit Scale with Latinx sample found a Cronbach's alpha of .73 (Vela et al., 2015). The scale was found to be internally consistent in this sample, with Cronbach's alpha of .78.

Academic Behaviors. Academic behaviors were measured using the *Self efficacy for self-regulated learning Scale* (Zimmerman, Bandura, & Martinez-Pons, 1992). Youth were asked to respond to 7 items on a scale (1) *strongly disagree* to (5) *strongly agree* 1-5, students reported the extent to which they agreed with statements like, "I motivate myself to do school work" (Appendix C). In previous studies internal consistency was high at a Cronbach's alpha of .87 (Zimmerman, Bandura, & Martinez-Pons, 1992). The scale was found to be internally consistent in this sample, with Cronbach's alpha of .83.

Wave 3

High School Academic Achievement. Adolescent's cumulative high school GPA (11th or 12th grade) was used as an indicator of academic achievement. A cumulative GPA includes all grades within one student's high school career, therefore, it provides a more consistent assessment than individual grades by subject (Beacon and Bean, 2006). In addition, meta-

analyses have found high school GPA is a common proxy to measure academic achievement (Grove, Wasserman, & Grodner, 2006; York, Gibson, & Rankin, 2015).

Results

Missing Data/Outlier Removal

The initial dataset consisted of 1,680 respondents, a total of 620 cases were omitted from analyses. Five hundred eighty-nine cases were deleted listwise due to missing data at any time point but was predominately a result of missing data from Wave 1. Listwise deletion was conducted over pairwise deletion in accordance of recommendations for Confirmatory Factor Analyses and Structural Equation Models (Schriber et al., 2006, Schumaker & Lomax, 1996). Listwise deletion also allowed for the use of full information maximum likelihood estimation in analyses (Arbuckle, 1999; Muthén & Muthén, 1998).

The remaining cases ($n=21$) were removed as outliers. Twenty-one cases failed the Mahalanobis test for multivariate outliers with a likelihood less than .001 (Tabachnick & Fidell, 2007). In an inspection of standardized residuals, no cases were found to be greater than three standard deviations above the mean. All remaining data was normally distributed (see Table 1). An independent t-test between excluded and non-excluded cases revealed no significant differences between age, gender, or ethnicity. In total, after removing the 641 cases that did not meet inclusion criteria, 1060 complete cases remained and were included in the final analyses.

Descriptive Analyses

The data was normally distributed across all measured constructs (see Table 2). At Wave 1, the English and Math proficiency score indicates that on average youth received scores indicating “basic” understanding ($M = 3.56$; $M = 3.42$), and youth received a B- average cumulative GPA (2.83). At Wave 2, youth had an average grit score of $M = 3.98$ and an average

academic behavior score of $M = 3.76$. Interestingly the average growth mindset score was quite high ($M = 4.16$) but was only slightly negatively skewed. In other words, the distribution of growth mindset scores in the sample was normal but youth scored high on growth mindset in general. Lastly, at Wave 3 youth received a B- average GPA ($M = 2.91$).

Preliminary Analyses

As shown in Table 1, noncognitive factor scores were highly correlated with one another. The strongest correlation was between grit and academic behaviors ($r = .60, p < .001$) and growth mindset and grit ($r = .56, p < .001$).

Noncognitive factors were also correlated with high school GPA at Wave 3 (see Table 2). Academic behaviors and high school GPA were moderately related ($r = .30, p < .001$) followed by growth mindset and high school GPA ($r = .27, p < .001$) and grit and high school GPA ($r = .29, p < .001$).

In addition, all junior high school academic achievement indicators (English proficiency level, math proficiency level, and GPA) were positively correlated with high school academic achievement (see Table 1). As expected, the strongest correlation was between junior high school GPA and high school GPA ($r = .58, p < .001$).

Measurement Model

The hypothesized model was specified with SPSS AMOS version 22 and estimated using maximum likelihood. Five tests assessed the overall fit of the model: (a) model χ^2 where a non-significant result suggests an acceptable fit, (b) model χ^2 to df ratio where a ratio of less than five suggests an acceptable fit, (c) comparative fit index (CFI) and incremental fit index (IFI) “goodness-of-fit” indices where values greater than or equal to .90 suggest an acceptable fit, (d) the root mean square error of approximation (RMSEA) “badness-of-fit” index where a value less

than or equal to .10 suggests an acceptable fit, and (e) the standardized root mean residual (SRMR) where a value of less than .08 suggests an acceptable fit.

The CFA results for items assessing all latent variables, including academic history, growth mindset, grit, academic behaviors, and high school academic achievement indicated acceptable fit for the measurement model. The model χ^2 test provided a significant result ($\chi^2(161) = 801.43, p < .001$) suggesting the hypothesized model is significantly different from the underlying correlation matrix. However, model χ^2 tests are extremely sensitive to sample size, so model χ^2 to df ratio was assessed as it is not as sensitive to sample size. The model χ^2 to df ratio was above the threshold ratio of five ($\chi^2/df = 4.98$) suggesting the hypothesized model was not supported. The “goodness-of-fit” indices provided support for the model (CFI = .92) by comparing the hypothesized model to the independence model. Similarly, the “badness-of-fit” index suggested an acceptable fit, RMSEA = .06 (90% CI: .057 – .066) by comparing the hypothesized model to the saturated model. Lastly, the SRMR provided further support of the measurement model (SRMR = .05). Three out of the five fit indices suggested the model was an acceptable fit for the data. In other words, all latent variables (academic history, growth mindset, grit, academic behaviors, and academic achievement) were adequately measured and represented in the sample.

The unstandardized and standardized estimates as well as their standard errors can be found at Table 3. All standardized factor loadings were significant at $p < .001$ and most parcel loadings were high. Junior high school English proficiency scores, math proficiency scores, and GPA item loadings were above the recommended cut-off of .6 (DiStefano, Zhu, & Mindrila, 2009). Similarly, all growth mindset loadings were above the recommended cut-off point. For grit, 3 out of the 4 loadings were above the cut off and one item (“I bounce back from obstacles”)

was below the recommended cut-off at $\beta = .46$. For academic behaviors 5 out of the 7 loadings were above the cut-off and 2 items were below. The first was “I study even when there are other interesting things to do” at $\beta = .59$, and the second item was “I participate in class discussion” $\beta = .49$. Given that the model showed adequate model fit, all items remained in the Structural Equation Model.

Structural Equation Model

The hypothesized Structural Equation Model (SEM) was tested using full information maximum likelihood estimation on AMOS 4.01.

The SEM results indicated latent variables and the hypothesized pathways were a “good fit” to the data. The model χ^2 test provided a significant result ($\chi^2 (163) = 805.68, p < .001$) suggesting the hypothesized model was significantly different from the underlying correlation matrix. However, model χ^2 tests are extremely sensitive to sample size, and since this sample was large the χ^2 was expected to be significant so model χ^2 to df ratio was assessed as it is not as sensitive to sample size. The model χ^2 to df ratio was above the threshold ratio of five ($\chi^2/df = 4.94$) suggesting the hypothesized model was not supported. The “goodness-of-fit” indices provided support for the model (CFI = .92) by comparing the hypothesized model to the independence model. Similarly, the “badness-of-fit” index suggested an acceptable fit, RMSEA = .06 (90% CI: .057 – .065) by comparing the hypothesized model to the saturated model. Lastly, the SRMR provided further support of the measurement model (SRMR = .05). Three out of the five fit indices suggested the model was an acceptable fit for the data. In other words, the hypothesized model significantly represented pathways existent in the data.

Figure 2 displays all associations between the latent variables and their corresponding standardized regression weights. All regression path coefficients were significant ($p < .001$)

except for the direct relationship between growth mindset and academic behaviors which was marginally significant ($p = .05$). As expected, the effect of prior academic history on adolescent's high school academic achievement was substantial ($.62, p < .001$).

Hypothesis (a) was supported. In the supported SEM, youth's academic behaviors partially mediated the relationship between junior high school academic achievement in Wave 1 and high school academic achievement in Wave 3 (see Figure 2). Academic behaviors in Wave 2 accounted for 30% ($p < .001$) of the variance in high school academic achievement in Wave 3.

Hypothesis (b) was not supported: growth mindset did not mediate the relationship between junior high school academic achievement in Wave 1 and academic behaviors in Wave 2. Direct effects indicate that junior high school academic achievement contributed to the development of growth mindset ($.23, p < .001$), however, growth mindset was only marginally related to academic behaviors ($.09, p = .05$).

Hypothesis (c) was supported: youth's level of grit mediated the relationship between junior high school academic achievement in Wave 1 and academic behaviors in Wave 2 (see Figure 02.). Junior high school academic achievement moderately contributed to youth's development of grit ($.20, p < .001$) and grit substantially related to academic behaviors ($.75, p < .001$). Prior academic history only marginally contributed to the development of academic behaviors in the tested model ($-.07, p = .05$).

Indirect Effects

To test the significance of indirect effects of growth mindset to high school academic achievement and grit to academic achievement, a bootstrapping method was used with 2000 bootstrap resamples to estimate 95% bias-corrected confidence interval (Hayes, 2012). Bootstrapping tests the statistical significance of data existing in a non-normal

distribution: if the 95% CIs do not include zero, findings are considered significant at the $p < .05$ level.

The bootstrapped unstandardized indirect effect of grit on high school academic achievement was .23, and the 95% confidence interval ranged from .18 to .28; the indirect effect was therefore statistically significant. The bootstrapped unstandardized indirect effect of growth mindset on high school academic achievement was .03, and the 95% confidence interval ranged from -.006-.054; therefore, the indirect effect was not statistically significant.

Discussion

This study tested a model that suggests three noncognitive (i.e., academic behaviors, growth mindset, grit) pathways to academic achievement for Latinx youth, a population in need of academic interventions. The theoretical model tested in this study was found to fit the data well. First, this study concluded that the relationship between junior high school academic achievement and high school academic achievement was partially mediated by academic behaviors in high school for Latinx youth. Secondly, the relationship between junior high school and high school academic behaviors was not mediated by growth mindset for Latinx youth. And lastly, the relationship between junior high school academic achievement and high school academic behaviors was strongly mediated by grit for Latinx youth.

Hypothesis (a) was supported. Academic behaviors in Wave 2 partially mediated the relationship between junior high school (Wave 1) and high school academic achievement (Wave 3). As expected, Latinxs' junior high school academic achievement accounted for a significant amount of variance (62%) in high school academic achievement. However, Latinxs' academic behaviors explained an additional proportion of unique variance in academic achievement. While this is unsurprising given the overwhelming support of the relationship between academic

behaviors and academic achievement in the literature (Allensworth & Easton, 2007; Conrad, 2006), this is the first study to test the causality of the relationship in a Latinx sample.

These results have two broader implications. First, Latinx youth are particularly likely to struggle academically by eighth grade (Fry, 2004). Findings from this study suggest their junior high achievement influences their high school achievement. Accordingly, school policy and college readiness interventions for Latinx youth should begin as early as seventh and eighth grade. Second, because Latinxs' engagement in academic behaviors accounted for additional variance in academic achievement beyond prior achievement, college readiness interventions should continue to target academic behaviors in high school.

Hypothesis (b) was not supported. Growth mindset did not mediate the relationship between junior high school academic achievement and academic behaviors in Latinx youth. The implicit belief of the malleability of intelligence did not directly relate to Latinx youth engaging in academic behaviors nor their overall GPA. However, growth mindset was strongly correlated to grit ($r = .55$) and moderately correlated to GPA ($r = .27$; see Table 1). There are several theoretical explanations for why the expected relationship may not have been present in this study. First, some theorists argue that growth mindset may not directly relate to academic behaviors or academic achievement, but rather act through other pathways (e.g. influencing the development of achievement goals) which in turn foster academic achievement (Dweck, Walton, & Cohen, 2011). Second, other researchers argue the relationship between intelligence beliefs and actionable steps towards increasing content knowledge may be mediated by grit (Farrington, et al., 2012). Third, it is possible that growth mindset may not be as significant for this low-income Latinx population because minority populations are less likely than middle-income Caucasian students to be recognized for academic effort (Sebastian, 2017). The lack of

recognition for effort may engender a belief among Latinx youth that the malleability of their intelligence does not make a difference in their education. Each of these arguments suggest growth mindset may not directly impact academic achievement in the ways outlined by the Farrington model. More research must be conducted to further understand growth mindset's relationship with academic achievement, and to determine whether other factors mediate the relationship between growth mindset and academic behaviors among Latinx youth.

Lastly, hypothesis (c) was supported: Latinxs' level of grit mediated the relationship between junior high school academic achievement and academic behaviors in high school. Latinxs' perseverance toward academic long term goals explained 75% of the variance in their engagement in academic behaviors. These findings support the literature and suggests grit is a significant mediator of junior high school academic achievement and high school academic behaviors (Farrington, 2012). However, the strength of this relationship is surprising and has yet to be demonstrated in the literature. Given that grit has been significantly understudied in the Latinx population, there is little empirical evidence to explain grit's significant relationship with academic behaviors for Latinx youth. One theoretical explanation is that perseverance towards long term goals may be necessary for Latinxs to combat racial oppression (i.e., classroom microaggressions, segregated school systems etc.) and other obstacles they experience in the classroom to still engage in academic behaviors in high school. This may suggest grit is important for other ethnic minority groups as well (e.g., African-Americans, Native Americans etc.). More research must be conducted to further understand why grit is a substantially important noncognitive factor for Latinx youth.

In the presented model, grit had a greater impact on youths' behaviors than junior high school academic achievement and growth mindset. The relationship between grit and growth

mindset, in the few studies that have studied the constructs together, has remained unclear. One study suggests grit mediates the relationship between growth mindset and academic achievement (Farruggia et al., 2016), which could explain why grit's relationship to academic behaviors was stronger than growth mindset's relationship to academic behaviors in the present study.

However, both grit and growth mindset have been understudied in the Latinx population at large. Future research is necessary to understand why grit's pathway significantly outweighed growth mindset's pathway among Latinx youth.

Limitations and Future Directions

There are three primary limitations to the current study that result from this research being a secondary data analysis. First, data on grit, growth mindset, and academic behaviors were not collected at Wave 1. This means, that it was not possible to determine baseline levels of variables collected at Wave 2. Second, there were no cultural measures specific to Latinxs' lived experience (e.g., *familismo*, *respeto*, discrimination, resilience) that may have provided additional variance explained for this population. Lastly, although this study sought to target Latinx youth, a sample often understudied and in great need of academic intervention, including one ethnic group limits comparisons with non-Latinx youth. Future studies should examine whether the noncognitive pathways in the presented model differ for other groups.

Despite these relatively minor limitations, the present study illuminates promising directions for further research and intervention design for Latinx youth. Given the results of the present study, future research should investigate grit as an outcome for Latinx adolescents. In particular, research should aim to understand how grit develops in Latinx youth as well as study reasons for its importance in predicting academic achievement among this population.

Interventions that aim to increase college access among Latinx should continue to target content

knowledge in the formative, early adolescent, years. In addition, college readiness intervention designs targeting Latinx high school students should highlight practices that foster grit and positive academic behaviors in the first two years of high school.

Conclusion

This study provides an empirically validated model that explains noncognitive pathways to academic achievement across a developmentally critical time period. This study is the first to provide longitudinal evidence of how 7th and 8th grade academic achievement directly impacts the development of critical noncognitive factors as well as explains how those noncognitive factors relate to later high school academic achievement. Additionally, this study is the first to analyze these pathways in a primarily Latinx sample. Therefore, these findings have direct implications for the design and implementation of college readiness interventions. Junior high schools and after-school programs should continue to target content knowledge and academic competency to start Latinx youth on a trajectory of high-academic achievement. In addition, high school interventions should foster grit, especially for Latinx youth. Such interventions should begin early in youths' academic careers (e.g., junior high school) and continue throughout the early formative years of high school. Through further study and implementation of effective academic achievement interventions, Latinx youth will have greater opportunities to enroll and persist through college.

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Figure 01. The theory-based hypothesized model

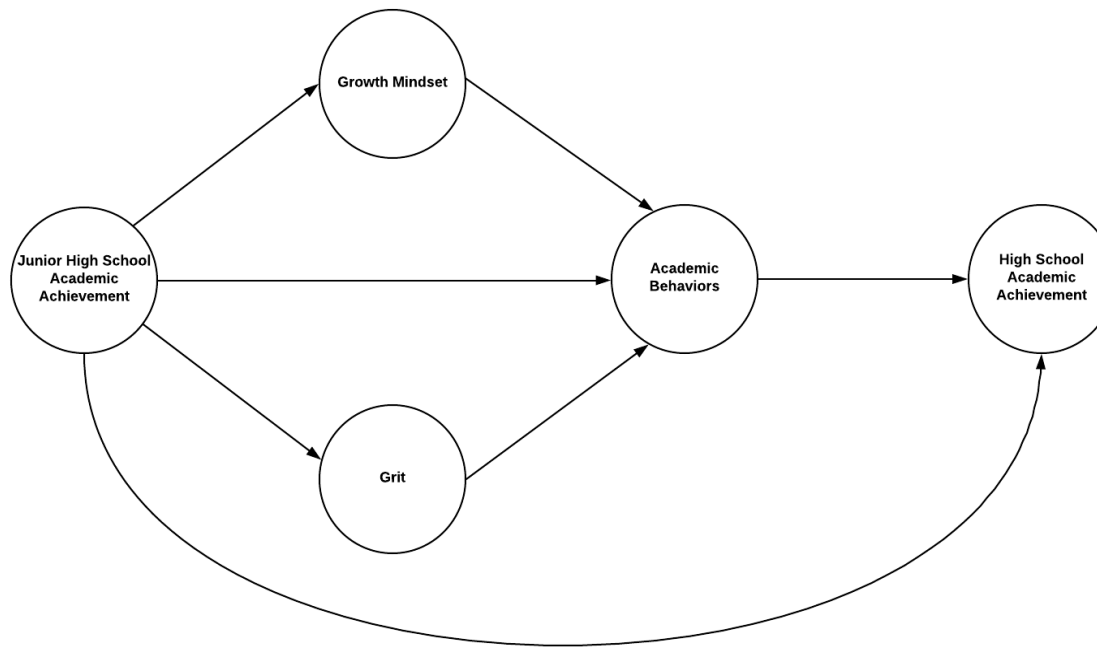


Table 01. Scale Information and Descriptive Statistics for Constructs Measured (N = 1060)

	Mean	SD	Skew	Kurtosis
Wave 1 (2012)				
English Proficiency	3.56	.98	-.49	-.068
Math Proficiency	3.42	1.09	-.28	-.67
GPA	2.83	.79	-.62	-.05
Wave 2 (2016)				
Growth Mindset	4.14	.62	-.23	-.76
Grit	3.98	.62	-.23	-.59
Academic Behaviors	3.76	.63	-.162	-.262
Wave 3 (2017)				
GPA	2.91	.64	-.51	-.27

Table 02. (Spearman's rho) between all measured variables (N= 1060)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) English Proficiency Level	-						
(2) Math Proficiency Level	.67***	-					
(3) 2012 GPA	.49***	.53***	-				
(4) Academic Behaviors	.03	.03	.14***	-			
(5) Grit	.17**	.12**	.16***	.59***	-		
(6) Growth Mindset	.19***	.53**	.14***	.51**	.55***	-	
(7) 2017 End Spring	.46***	.50**	.58***	.31***	.29***	.27***	-

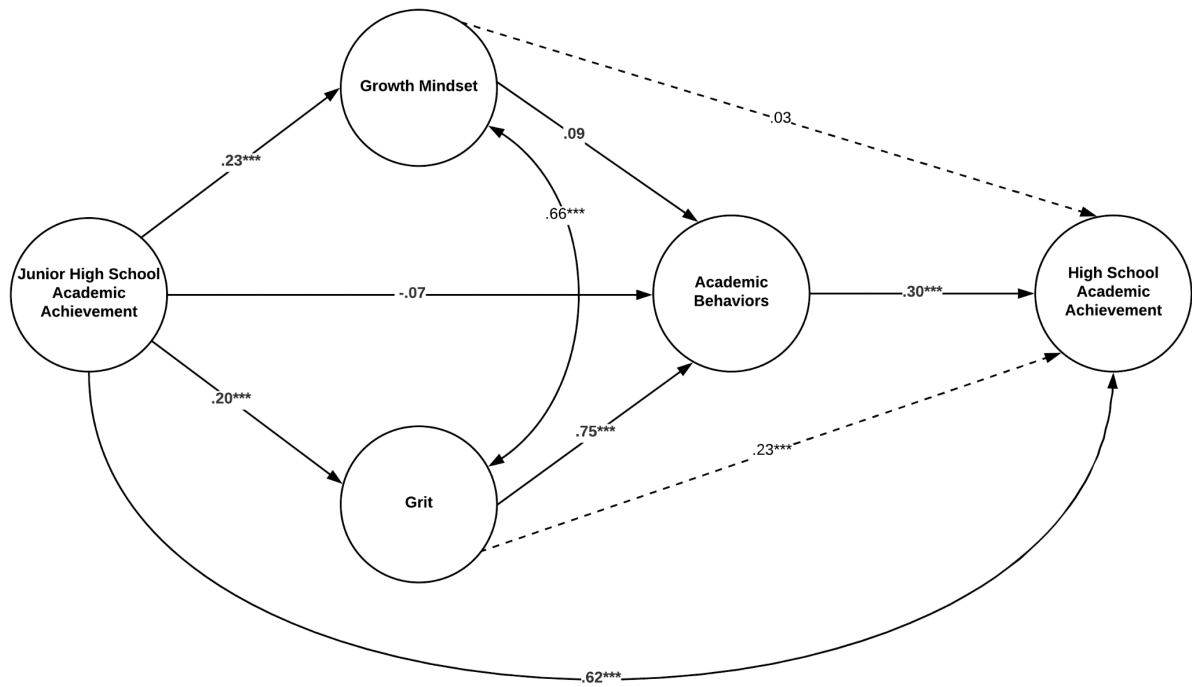
***= $p < .001$

Table 03. CFA Item Loading

	β	SE
EARLY ACADEMIC ACHIEVEMENT		
English Proficiency	.78	.02
Math Proficiency	.82	.02
2012 GPA	.67	.03
GROWTH MINDSET		
I can master the skills taught in school this year.	.78	.02
I can figure out how to do the most difficult work in school.	.82	.02
I can do almost all the work in my classes if I don't give up.	.67	.02
Even if the lesson is hard, I can learn it.	.82	.01
I can do even the hardest work in school if I try.	.80	.01
GRIT		
I bounce back from obstacles.	.46	.03
I finish whatever I begin.	.71	.02
I am a hard worker.	.77	.02
Setbacks don't discourage me	.62	.03
ACADEMIC BEHAVIORS		
I finish homework assignments by deadlines.	.66	.02
I study even when there are other interesting things to do.	.59	.02
I plan my school work.	.76	.02
I organize my school work.	.69	.02
I arrange a place to study without distractions	.79	.02
I motivate myself to do school work.	.67	.02
I participate in class discussions.	.49	.03

GRIT IN LATINX YOUTH

Figure 02. Results of the tested SEM including standardized regression weights.



Appendix

Appendix A

GROWTH MINDSET: Academic Efficacy subscale from Patterns of Adaptive Learning Scales (PALS) (Midgley et al., 2000)

1. I can master the skills taught in school this year.
2. I can figure out how to do the most difficult work in school.
3. I can do almost all the work in my classes if I don't give up.
4. Even if the lesson is hard, I can learn it.
5. I can do even the hardest work in school if I try.

Appendix B

GRIT: Grit Scale—Child-Adapted Version (Duckworth & Quinn, 2009; Duckworth, Peterson, Matthews, & Kelly, 2007):

1. New ideas and projects sometimes distract me from old ones.
2. I often set a goal but later choose to follow a different one.
3. I have been excited with a certain idea or project for a short time but later lost interest.
4. I have difficulty keeping my focus on projects that take more than a few months to complete.
5. I bounce back from obstacles.
6. I am a hard worker.
7. I finish whatever I begin.
8. Setbacks don't discourage me

Appendix C

ACADEMIC BEHAVIORS: Self efficacy for self-regulated learning (Zimmerman, Bandura, & Martinez-Pons, 1992)

1. I finish homework assignments by deadlines.
2. I study even when there are other interesting things to do.
3. I plan my school work.
4. I organize my school work.
5. I arrange a place to study without distractions
6. I motivate myself to do school work.
7. I participate in class discussions.

