



Parental Involvement and Adolescent Academic Outcomes: Exploring Differences in Beneficial Strategies across Racial/Ethnic Groups

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Abstract

Gaps in educational outcomes between racial/ethnic and socioeconomic groups persist in the United States, and parental involvement is often cited as an important avenue for improving outcomes among racially/ethnically diverse adolescents. This study utilized data from the Education Longitudinal Study 2002–2013 (56% female, $N = 4429$), which followed 10th-graders through high school and ten years post-high school, to examine the links between parental involvement strategies and academic outcomes (grade point average and educational attainment). Participants included white, African American, and Hispanic/Latino adolescents from low-SES families. This study used recursive partitioning, a novel analytic strategy used for exploring higher-order interactions and non-linear associations among factors (e.g., parental educational involvement strategies) to predict an outcome (e.g., grade point average or educational attainment) through step-wise partitioning. The results showed that the combination of greater academic socialization and school-based involvement was beneficial for all adolescents' grade point average, whereas the combination of home-based involvement with academic socialization and school-based involvement yielded mixed results. Greater academic socialization and home-based involvement appeared beneficial for educational attainment among African American and Hispanic/Latino adolescents, but not white adolescents. More home-based involvement and less academic socialization were associated with less educational attainment for white adolescents. Overall, the findings showed different combinations of parental educational involvement strategies were beneficial for adolescents across racial/ethnic groups, which may have implications for practice and policy.

Keywords Parent involvement in education · Educational attainment · High school students · Race/ethnicity · Recursive partitioning

Introduction

Educational attainment has been associated with a plethora of beneficial outcomes such as better physical and mental health and higher levels of overall life satisfaction (e.g., National Center for Education Statistics 2017; Murrell et al. 2003). Unfortunately, in the United States, gaps continue to persist between racial/ethnic and socioeconomic groups for

a range of academic outcomes such as educational attainment and academic achievement. For example, the National Center for Education Statistics (2016a) found that 63.2% of white, first-time, full-time college students graduated within 6 years of starting their degree, compared to just 40.9% of black students and 53.5% of Hispanic/Latino students. They also found gaps in test scores by national school lunch program eligibility (NSLP; a measure of socioeconomic status); eighth-graders who were eligible for NSLP scored 28 points lower in math and 24 points lower in reading than non-eligible eighth-graders (National Center for Education Statistics 2016b). These disparities, along with other measures of inequality in academic outcomes, such as high school dropout rates and college admission rates, continue to fuel debate among policy-makers and practitioners as to what factors may ameliorate these gaps.

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Parental educational involvement—parenting practices at home or at school intended to improve academic outcomes—is often cited as an important avenue for improving academic achievement and subsequent educational attainment among diverse populations of students (e.g., Hill et al. 2004). The empirical research investigating the effectiveness of parental educational involvement for adolescents has grown dramatically in the last decade, building a strong research foundation on the topic of parental educational involvement (Cheung and Pomerantz 2012; Gonzalez-DeHass et al. 2005; Hill and Chao 2009; Pomerantz et al. 2007). Unfortunately, there is still a limited understanding of the most beneficial parental educational involvement strategies for adolescents. In particular, findings remain inconclusive regarding the effectiveness of parental educational involvement strategies for low-income, racial/ethnic minority adolescents—the adolescents who may most need additional support in school (Hill et al. 2004; Jeynes 2007). Therefore, this study utilized data from the Education Longitudinal Study of 2002 to examine the links among parental educational involvement strategies and academic outcomes for a diverse population of adolescents from low-income families. Further, a substantial limitation of previous work has been the sole focus on independent associations between facets of parental involvement and academic outcomes (Benner et al. 2016; Jeynes 2007; Suizzo et al. 2012; Wang et al. 2014; Wang and Sheikh-Khalil 2014). In reality, none of these parenting strategies operates in isolation; it may be the joint effects of various facets of involvement that best predict adolescents' academic outcomes. As such, this study used recursive partitioning, an analytic strategy to identify higher-order interactions (e.g., three-way and four-way) among variables, to explore the combinations of parental educational involvement strategies that are associated with academic outcomes.

Parental Educational Involvement in High School

Parental educational involvement tends to decline as children age, but nevertheless continues to be an important means of support for high school students' academic achievement and educational attainment (Benner et al. 2016; Falbo et al. 2001; Kuperminc et al. 2008; Stewart 2008). It is well recognized in the literature that parental educational involvement is a multi-faceted construct that includes a variety of parenting strategies such as parents' participation in school events, involvement with school-work at home, or communication about the importance of school (Hayes 2011; Hill and Tyson 2009; Stewart 2008; Toldson and Lemmons 2013). Parental involvement is often classified into three categories: home-based involvement, school-based involvement, and academic socialization (e.g., Hill and Tyson 2009). Home-based involvement typically includes parents' structure of the home environment to

support academics (e.g., enforcing house rules regarding how adolescents spend their time) and parents' help with homework. School-based involvement includes parenting practices that involve visiting or communicating with the school, such as volunteering or attending parent-teacher organization meetings. Academic socialization involves parents' communication about the value of an education for adolescents' future education and career plans (e.g., Hill and Tyson 2009; Wang and Sheikh-Khalil 2014). All three forms of involvement have been associated with academic outcomes for high school students (e.g., Benner et al. 2016; Jeynes 2007; Suizzo et al. 2012), although scholars have suggested that academic socialization is most strongly linked to academic outcomes (Hill and Tyson 2009).

Parental Educational Involvement and Academic Outcomes

Numerous studies have investigated the association between parental educational involvement and adolescents' academic outcomes such as achievement and educational attainment. Most commonly, researchers have explored how parental educational involvement relates to academic achievement (Jeynes 2007). Academic achievement has been defined using a variety of measures including grade point average (GPA), standardized test scores, and adolescent-reported subject-specific grades (e.g., B in Math, A in Reading, D in Science). Generally, more parental educational involvement is associated with higher levels of academic achievement (Gordon and Cui 2012; Stewart 2008; Toldson and Lemmons 2013; Wang et al. 2014). Differences arise, however, when identifying which specific involvement strategies are most beneficial. For example, on the one hand, Benner and colleagues (2016) found school-based involvement and educational expectations to be beneficial for adolescents' GPA, but not home-based involvement or academic advice. On the other hand, Gordon and Cui (2012) found that parents who provided homework help had adolescents with higher GPA's.

Though less prevalent, studies have also investigated the link between parental educational involvement and educational attainment (e.g., Anguiano 2004; Benner et al. 2016). Educational attainment is often defined as the highest level of education an individual achieves, including graduation from high school, college admittance, or completing a higher education degree. Adolescents whose parents are more involved with their education tend to be more likely to graduate from high school and attend college. For example, Catsambis (2001) found that parental educational involvement was positively associated with academic credits completed by 12th grade. It is important to note that the most effective strategies were those related to decision-making (e.g., conversations about academic and career

plans) versus those related to adolescent behavior (e.g., parental supervision of homework). Benner and colleagues (2016) also found an overall positive link between parental educational involvement and educational attainment, although differences emerged by SES and prior achievement levels. Academic socialization was particularly beneficial for more advantaged students whereas school-based involvement was more beneficial for less advantaged students. Anguiano (2004) found that school-based involvement was not a strong predictor of high school completion compared to other measures of parental involvement.

Overall, although these findings clearly link parental educational involvement and academic outcomes, they offer little conclusive evidence as to which specific parental educational involvement strategies are most beneficial for racially/ethnically diverse adolescents (e.g., home-based strategies were beneficial for some adolescents, but not all). Researchers have begun investigating how adolescents' race/ethnicity may be associated with parental involvement and academic outcomes (e.g., Mistry et al. 2009). No work, however, has been done to explore how combinations of strategies may help clarify what works best for adolescents, despite the frequency with which parental educational involvement strategies co-occur (e.g., Williams and Sánchez 2012).

Differences by Race/Ethnicity

Scholars have widely discussed potential explanations for differences in the benefits of parental involvement for adolescents by racial/ethnic and socioeconomic groups. Adolescents from lower SES families and/or racial/ethnic minority youth face unique challenges in education. For example, for minority and low SES adolescents, family culture and school culture may be incongruent, and parents may construct their roles regarding the academic environment differently than white or higher SES parents (Auerbach 2007; Garcia-Coll et al. 1996; Hill and Torres 2010). The social positions of these families and adolescents may influence adolescent development via racism, oppression, prejudice, and discrimination (Garcia-Coll et al. 1996). While parents may still have high aspirations for their children, a mismatch between home and school cultures may stifle their abilities to support their children (Hill and Torres 2010). For example, Hispanic/Latino parents have reported wanting higher academic standards and stricter rules than schools require (see Hill and Torres 2010 for a review) and parents may feel unwelcome or shut out from schools due to language barriers (Reynolds et al. 2015). More broadly, speech patterns, social organization, and contextualization of instruction may not align with family norms or organization of the home environment, creating challenges for families and youth to feel connected to or

involved with the school (Garcia-Coll et al. 1996; Hill and Torres 2010; Lareau 2011).

Further, parents' social class and personal experiences may influence their role construction regarding their involvement (Auerbach 2007; Rowan-Kenyon et al. 2008). Suizzo and colleagues (2015) found that low-income, racially/ethnically diverse parents' memories of school satisfaction were related to their academic socialization parenting practices. Auerbach (2007) interviewed 16 working-class African American and Latino parents over three years to learn how they perceived their role in education. Three themes emerged: parents as moral supporters (all Latino parents who had the lowest levels of educational attainment), struggling advocates who were involved as much as they could be but faced barriers to involvement (mixed race/ethnicity and educational attainment), and ambivalent companions, who offered little support and recognized the value of an education without being involved (mostly single mothers and parents with educational attainment of community college or less). It is clear that racially/ethnically diverse and low SES parents may face unique barriers to involvement (e.g., cultural mismatch between home and school) and have different reasons for becoming involved or strategies for involvement (e.g., moral support vs school involvement). These differences may be related to the association between parental educational involvement and adolescent academic outcomes.

Past research has examined the potential differences in links between parental educational involvement and academic achievement among racially/ethnically diverse adolescents (e.g., Zhang et al. 2011). For example, Wang et al. (2014) examined achievement trajectories in high school and their association with parental educational involvement. Findings showed that while all aspects of involvement were related to reduced declines in GPA, structure at home (e.g., family rules) was more strongly related to reduced declines for African American adolescents compared to white adolescents. Yan and Lin (2005) found differences in the association between parental educational involvement and mathematics achievement across racial/ethnic groups. While parents' educational expectations were associated with mathematics achievement for all adolescents, school-based involvement was related to achievement only for white and Hispanic adolescents. This finding is in contrast with the findings from Hill and colleagues (2004) that school-based involvement was related to GPA for African American adolescents but not white adolescents. Given these mixed findings, more work needs to be done to explore how strategies may vary in their effectiveness for racially/ethnically diverse adolescents.

Little empirical work has investigated the potential differences in the links between parental educational involvement and educational attainment based on race/ethnicity.

Anguiano (2004), for example, found differential associations between parental educational involvement and high school completion across race/ethnicity (e.g., parental advocacy was more strongly related to attainment for Hispanic/Latino students than for white students). Given the increasing importance of educational attainment for long-term career success (Carnevale et al. 2013), it is imperative to better understand the parental educational involvement strategies that may be most beneficial for racially/ethnically diverse adolescents.

Exploring Combinations of Parental Educational Involvement Strategies

The present study also explored how combinations of parental educational involvement strategies may be related to academic outcomes. Prior work has primarily examined parental educational involvement as a general, single parenting behavior (e.g., Dotterer and Wehrspann 2016a, b; Kuperminc et al. 2008), or as individual facets uniquely predicting outcomes (e.g., Bhargava and Witherspoon 2015). The lack of attention to dynamic interplay among parent involvement strategies in the literature is a substantial limitation given that parents often use a variety of parental educational involvement techniques. In quantitative studies assessing different facets of parental involvement, involvement strategies tend to be significantly correlated (e.g., Bhargava and Witherspoon 2015). For example, in Suizzo and colleague's (2012) study, providing an environment for learning (i.e., home-based involvement) was strongly correlated with parents providing messages about the importance of school (i.e. academic socialization). Further, qualitative analyses involving in-depth interviews have revealed that parents use several parental educational involvement strategies (e.g., Auerbach 2007). For example, African American parents discussed physical connections to their adolescents' school, involvement outside of school including educational assistance and structure at home, and communication all as ways through which they were involved in their adolescents' education (Williams and Sánchez 2012). Taken together, these qualitative and quantitative findings suggest that parents use a variety of educational involvement strategies, rather than a single strategy in isolation. Further, it may not be realistic to recommend parents simply offer more involvement overall, given competing demands for their time and attention (e.g., balancing work and home lives), cultural differences in approaches/barriers to involvement (e.g., Garcia-Coll et al. 1996; Hill and Torres 2010; Lareau 2011), and evidence that there may be diminishing returns for adolescents' academic outcomes with increasing levels of involvement (Wehrspann et al. 2015). Exploring higher-order interactions of strategies among racially/ethnically diverse low-

income adolescents and their families may be helpful for illuminating the most beneficial ways parents can promote adolescents' academic outcomes, considerations that have not been included in previous studies.

The Current Study

This study used the Education Longitudinal Study of 2002 to investigate the links between parental educational involvement and academic outcomes among racially and ethnically diverse low-income high school students. Two research questions were explored. First, which combinations of parental educational involvement strategies are associated with academic outcomes (GPA and educational attainment)? Second, how do these combinations of strategies vary by race/ethnicity? Given the exploratory nature of these analyses and limited prior work addressing this question, no a priori hypotheses were offered.

We intentionally focused our study on the interactive effects of parental educational involvement strategies, rather than single strategies or additive effects of each strategy, given that prior work has shown parents use combinations of strategies to support their adolescents (e.g., Williams and Sánchez 2012). We utilized a novel method, recursive partitioning, as it allowed us to explore higher-order interactions among involvement strategies and other factors associated with adolescent academic outcomes. Additional factors included in analyses were adolescent sex, parents' primary spoken language, school size, and amount of school outreach to parents, as these factors have been associated with parental educational involvement and academic outcomes (e.g., Benner et al. 2016; Epstein 2001; Pomerantz et al. 2002). Our sample included low-income adolescents who identified as white, African American, and Hispanic/Latino. We selected this group of adolescents because these are the three largest racial/ethnic groups in the United States (U.S. Department of Commerce 2011) and low-income adolescents tend to need more academic support compared to their higher-income peers (e.g., National Center for Education Statistics 2016b). Using the Education Longitudinal Study of 2002 had the advantage of a substantial number of items tapping into parental educational involvement as well as a large sample of racial/ethnic minority adolescents and parents from low-SES families.

Methods

Procedure

Data for these analyses came from the Education Longitudinal Study of 2002 (ELS) dataset. The ELS was

administered by the National Center for Education Statistics of the Institute of Education Sciences, U.S. Department of Education and surveyed a nationally representative sample of high school sophomores (Ingels et al. 2014). The ELS study used a complex sampling design to survey adolescents, parents, teachers, principals, and librarians during the base year with two follow-up surveys that took place two and four years after the base year, and a third follow-up that took place 10–11 years after the base year. Data collected from adolescents and parents during the base year (response rates of 87.3% and 87.4%, respectively; Christopher 2017), and adolescents during the first follow-up, and third follow-up were used in the present study. At third follow-up, 83.9% of base-year adolescents participated (Ingels et al. 2014). Adolescents completed surveys in school at baseline and first follow-up years. Parents completed hard-copy surveys or computer assisted personal interviews. During the third follow-up, adolescents completed a self-administered online survey or participated in a computer-assisted interview or telephone interview.

Participants

Participants for the present study included parent–adolescent dyads from low SES families with data from base year (adolescents were in 10th grade), the first follow-up (adolescents were in 12th grade), and the third follow-up (adolescents were approximately eight years post-high school; $N = 4429$). Socioeconomic status (SES) was calculated by NCES using five items from the parent questionnaire. When data were missing, student questionnaire data were used, and if unavailable, scores were imputed by NCES. SES was based on equally weighted, standardized components including father's education level, mother's education level, family income, father's occupational status, and mother's occupational status. Occupational status was determined using the 1989 GSS occupational prestige scores (Ingels et al. 2014). For the current study, adolescents were initially split into SES quartiles. Analysis of Variance identified significant differences in educational attainment and GPA across all four groups – educational attainment: $F(3, 9196) = 412.303$, $p < .001$, and GPA: $F(3, 9196) = 268.14$, $p < .001$. Post-hoc Tukey analyses revealed no differences between the first and second quartiles for each racial/ethnic group, however. Therefore, these quartiles were combined for the present study to explore the combinations of factors associated with academic outcomes for low-income adolescents of different racial/ethnic groups. Adolescents in the third and fourth SES quartiles were not included in these analyses. Overall, 56% of participants were female and over half identified as white (60%). Twenty-two percent of adolescents were Hispanic or Latino and 18% were Black or African

American. Seventy-three percent of adolescents' parents spoke English as their native language.

Measures

Race/ethnicity

Adolescents were asked to identify their race/ethnicity. When data were missing on the questionnaire, race/ethnicity were obtained by NCES from the school sampling roster, and when missing on the sampling roster, from the parent survey if the parent was the adolescent's biological parent. Otherwise, race/ethnicity was logically imputed from other questionnaire items (Ingels et al. 2014). The final variable for adolescent race/ethnicity consisted of white, Hispanic or Latino, Black or African American, Asian or Pacific Islander, American Indian or Alaska Native, and multiracial. The present study included white, Hispanic or Latino, and Black or African American adolescents.

Parental educational involvement

Stata 13 was used to conduct Confirmatory Factor Analyses to verify that items used for parental educational involvement accurately represented three facets of involvement. All items can be found in the Appendix.

School-based involvement Parents answered four questions regarding their involvement at school (e.g., “Do you and your spouse/partner do any of the following? Act as a volunteer at school.” or “Belong to the school's parent-teacher organization.” 0 = *no*, 1 = *yes*). Global and component fit indices showed excellent model fit for school-based involvement: $\chi^2(2, N = 4429) = 6.22$, $p = .04$, $RMSEA = .02$, $CFI = .99$, $TLI = .99$. In all the following analyses, a total score was used to represent school-based involvement.

Home-based involvement Parents and adolescents responded separately to questions regarding home-based involvement. Parents responded to three questions (e.g., “How often do you... check that your tenth grader has completed homework?” or “Make and enforce curfews for your tenth grader on school nights?” 1 = *never*, 4 = *always*). Adolescents responded to six questions (e.g., “How often do your parents do the following? Check on whether you have done your homework.” or “Limit the amount of time going out with friends on school nights.” 1 = *never*, 4 = *often*). Model fit was poor for a single latent variable, but model fit substantially improved when parent and adolescent reports were separated and modeled as two correlated variables, $\chi^2(26, N = 4429) = 785.28$, $p < .001$, $RMSEA = .08$, $CFI = .99$, $TLI = .98$. In all the following

analyses, two average scores were used to represent home-based involvement—one for parents and one for adolescents.

Academic socialization Parents and adolescents also responded separately to questions regarding academic socialization. Parents responded to four questions (e.g., “How often have you and/or your spouse/partner provided advice or information about the following to your tenth grader? Applying to college or other programs after high school.” or “Selecting courses or programs at school.” 1 = *never*, 3 = *often*). Adolescents responded to six questions (e.g., “How often have you discussed the following with either or both of your parents or guardians? Going to college.” or “Your grades.” 1 = *never*, 3 = *often*). Model fit was poor for a single latent variable, but model fit substantially improved when parent and adolescent reports were separated and modeled as two correlated variables, $\chi^2(34, N = 4429) = 336.66, p < .001, RMSEA = .05, CFI = .99, TLI = .99$. In all the following analyses, two average scores were used to represent academic socialization—one for parents and one for adolescents.

Educational attainment

Educational attainment was measured using data from the third follow-up to determine the highest level of education for each adolescent. Responses ranged from 1 = *No high school credential* to 9 = *Doctoral degree*. Educational attainment was treated as a continuous variable in all analyses. The full scale was coded as follows: 1 = *No high school credential*, 2 = *High school credential*, 3 = *Some postsecondary attendance, no postsecondary credential*, 4 = *Undergraduate certificate*, 5 = *Associates degree*, 6 = *Bachelor’s degree*, 7 = *Post-baccalaureate certificate*, 8 = *Master’s degree*, 9 = *Doctoral degree*.

Grade point average

Adolescent GPA was measured using adolescent average GPA from grades 9–12 obtained from high school transcripts during the first follow-up year. GPA was recoded by the National Center for Education Statistics (NCES) into a 6-point scale (0 = 0–1, 1 = 1.0–1.5, 2 = 1.5–2.0, 3 = 2.0–2.5, 4 = 2.5–3.0, 5 = 3.0–3.5, 6 = 3.5–4.0).

Demographic variables

Demographic variables included adolescent and parent characteristics, as well as school characteristics. Adolescents were asked to report their sex. Parents were asked to report how often they were contacted by the school to volunteer (0 = none, 1 = one or more) and their primary

spoken language (0 = English, 1 = something other than English). School size was reported by school administrators.

Analytic Strategy

Recursive partitioning is an analytic strategy used for exploring higher-order interactions or non-linear pathways among factors to predict an outcome through step-wise partitioning (e.g., Gruenewald et al. 2008; Purpura et al. 2017; Speybroeck 2012). More specifically, all participants in a data set are continuously split into smaller groups based on categories or cut points of predictor variables to create the most homogenous groups as possible for the outcome. These splits result in a tree-like structure modeling factors associated with the outcome, as shown in Fig. 1. In this tree for 100 adolescents, two variables split the sample to create groups of adolescents with the highest and lowest academic outcome score. The tree shows low levels of variable 1 associated with the lowest score (Node 1), and a combination of high levels of both variables associated with the highest score (Node 4). It is important to note that these pathways are not indications of an order of events that lead to the outcome of study, but are a series of AND statements of the associations among the predictors in the pathway (Gruenewald et al. 2006).

Strobl and colleagues (2009) suggested that a “forest” of trees may provide the best depiction of the relations among variables, as opposed to a single tree. Therefore, in

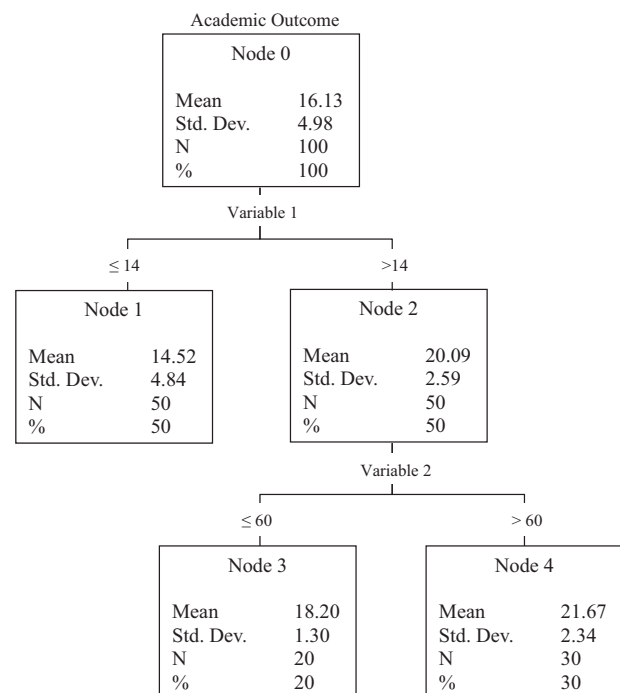


Fig. 1 Example of a single recursive partitioning tree

the present study, exhaustive chi-square automatic interaction detector (CHAID; Biggs et al. 1991) offered in IBM SPSS Decision Trees software was used to generate 50 trees for each racial/ethnic group for each outcome using home-based involvement, school-based involvement, academic socialization, and demographic variables as predictors. Exhaustive CHAID is an algorithm that uses F statistics for continuous outcomes to generate splits—when examining the cross-tabulation between each predictor and the outcome, CHAID will select the statistically significant relations ($\alpha = .05$) and if multiple relations are significant, the one with the smallest p value. Categories that are not significant are collapsed (IBM Corporation 2013). Bonferroni adjustments are made to reduce the chances of Type I error. The Decision Trees software also allows for the inclusion of an “influence variable” to account for weighted data. The NCES-developed analytic sampling weight for students who responded at base year, third follow-up, and had high school transcript data was used in all analyses.

Once 50 trees were generated for each outcome, trees to represent a forest for each racial/ethnic group were selected using the following criteria: (a) terminal nodes contained at least 5% of the sample (b) trees predicted unique pathways (i.e., if two trees modeled an identical pathway, the pathway was only represented in the forest once), and (c) trees explained a substantial proportion of variance. The Decision Tree software provides a risk estimate to assess within-node error variance. As described by Gruenewald and colleagues (2008), these estimates are difficult to interpret as raw statistics, but more accessible when analyzed in the context of total model variance. Therefore, the proportion of variance explained by each tree was calculated using risk estimates in the following equation:

$$1 - \frac{\text{risk estimate}_{\text{final model}}}{\text{risk estimate}_{\text{baseline model}}} \times 100$$

Trees that contained substantially low proportions of variance (<4% of variance) were excluded from the final forest for each group.

Sensitivity Analysis

In order to test the robustness of our findings, we used a split-sample validation technique. Each tree in each forest was grown in a randomly selected 60% of participants to create a training tree. This tree structure was applied to the remaining 40% of participants as a testing tree. T-tests were calculated to compare each pathway from the training and test samples. Trees with significant values, indicating significant differences in the outcome between the training and test tree, were not included in the forests for each outcome.

Results

Descriptive Statistics

Tables 1 and 2 provide correlations and descriptive statistics for all study variables for each racial/ethnic group. For African American adolescents, school-based involvement and adolescent reports of academic socialization were positively correlated with educational attainment and grade point average (GPA). T-tests revealed significant differences between males and females for educational attainment: female $M = 4.00$, male $M = 3.72$; $t(574) = -2.18$, $p < .05$, and GPA: female $M = 3.39$, male $M = 3.08$; $t(574) = -2.96$, $p < .01$. For Hispanic/Latino adolescents, adolescent reports of academic socialization were the only parental involvement strategy correlated with educational attainment and GPA. T-tests revealed significant differences between males and females for educational attainment: female $M = 3.93$, male $M = 3.55$; $t(724) = -3.34$, $p < .01$, and GPA: female $M = 3.86$, male $M = 3.25$; $t(724) = -6.03$, $p < .001$. For white adolescents (Table 2), school-based involvement and adolescent reports of academic socialization were positively correlated with educational attainment and GPA, whereas adolescent reports of home-based involvement were negatively correlated with educational attainment. T-tests revealed significant differences between males and females for educational attainment: female $M = 4.34$, male $M = 3.82$; $t(1946) = -6.54$, $p < .001$, and GPA: female $M = 4.39$, male $M = 3.87$; $t(1946) = -8.70$, $p < .001$.

Parental Educational Involvement and Grade Point Average

A total of 31 trees met inclusion criteria to represent the final forests of trees for GPA: three trees for African American adolescents, five trees for Hispanic/Latino adolescents, and thirteen trees for white adolescents. The substantially fewer number of trees for African American and Hispanic/Latino adolescents suggests the variables included in the analysis did not explain as much variance in GPA overall compared to white adolescents. The proportion of variance explained across these trees ranged from 3.93 to 13.19%. School contact, academic socialization, home-based involvement, and school-based involvement appeared across all forests.

As shown in Table 3, for African American adolescents, the proportion of variance explained by trees ranged from 3.93%–7.20%. School contact to parents, academic socialization, home-based involvement, and school-based involvement each appeared in at least one tree. The tree with the highest proportion of variance included school contact, academic socialization, and home-based involvement. Academic socialization appeared in all three trees, and

Table 1 Correlations for study variables for African American and hispanic/latino adolescents

Variables	1	2	3	4	5	6	7	8	9
<i>M (SD)</i> —Hispanic/Latino	3.58 (1.39)	3.76 (1.53)	1.43 (0.82)	4.59 (1.88)	3.20 (0.64)	2.61 (0.73)	0.90 (1.06)	2.09 (0.59)	2.08 (0.50)
Range—Hispanic/Latino	0–6	1–9	1–4	1–7	1–4	1–4	0–4	1–3	1–3
1. Grade point average	–	.49**	.09*	–.08*	.03	.00	.07	.01	.21**
2. Educational attainment	.39**	–	.03	–.03	.01	.02	.00	.07	.20**
3. School contact	.17*	.10*	–	–.12**	.03	.05	.29**	.14**	.16**
4. School size	–.10*	–.04	–.11*	–	.02	.02	–.12**	.11**	–.09*
5. Home-based involvement—parent	–.09	.00	.11*	.07	–	.16**	.21**	.31**	.09
6. Home-based involvement—adolescent report	.01	.04	.04	.03	.17**	–	.07	.08	.53**
7. School-based involvement	.14**	.10*	.40**	–.12*	.24**	.18**	–	.13**	.09*
8. Academic socialization—parent report	–.09	.07	.10*	.08	.34**	.09	.17**	–	.05
9. Academic socialization—adolescent report	.13*	.16*	.13*	.02	.09	.46**	.11*	.11*	–
<i>M (SD)</i> —African American	3.26 (1.25)	3.88 (1.53)	1.58 (0.92)	3.48 (1.56)	3.29 (0.63)	2.66 (0.75)	1.17 (1.31)	2.22 (0.59)	2.21 (0.50)
Range—African American	0–6	1–9	1–4	1–7	1–4	1–4	0–4	1–3	1–3

Note: African American adolescents below the diagonal, Hispanic/Latino above the diagonal

* $p < .05$; ** $p < .01$

Table 2 Correlations for study variables for White adolescents

Variables	1	2	3	4	5	6	7	8	9
1. Grade point average	–								
2. Educational attainment	.48**	–							
3. School contact	.13**	.13**	–						
4. School size	–.12**	–.02	–.15**	–					
5. Home-based involvement—parent	–.04	–.02	.07**	–.01	–				
6. Home-based involvement—adolescent report	–.06*	–.02	.05	.02	.21**	–			
7. School-based involvement	.08**	.13**	.38**	–.10**	.16**	.06*	–		
8. Academic socialization—parent report	.06*	.08**	.09**	.06*	.33**	.11**	.19**	–	
9. Academic socialization—adolescent report	.26**	.21**	.11**	.02	.09**	.46**	.06*	.18**	–
<i>M (SD)</i>	4.16 (1.35)	4.11 (1.75)	1.53 (0.87)	2.80 (1.64)	3.20 (0.57)	2.57 (0.68)	0.95 (1.22)	2.11 (0.54)	2.09 (0.50)
Range	0–6	1–9	1–4	1–7	1–4	1–4	0–4	1–3	1–3

* $p < .05$; ** $p < .01$

home-based and school-based involvement appeared in just two. Parental educational involvement strategies also appeared in combination; greater academic socialization in combination with greater school-based involvement was associated with higher GPA. Less home-based involvement in combination with moderate levels of academic socialization was associated with lower GPA. A three-way interaction of parental educational involvement strategies also

emerged; greater academic socialization and home-based involvement, in combination with less school-based involvement, was associated with lower GPA. One three-way interaction among school factors and involvement strategies included school contact \times academic socialization \times home-based involvement.

For Hispanic/Latino adolescents, the proportion of variance explained by trees ranged from 4.01 to 7.15% (see

Table 3 Recursive partitioning analyses for African American and Hispanic/Latino adolescents—grade point average

Tree	R ²	GPA	Sex	School size	School contact	Academic socialization		Home-based involvement		School-based involvement
						Parent report	Adolescent report	Parent report	Adolescent report	
African American										
1	7.20	4.50			>1.00		2.00–2.40			
		2.25			≤1.00	2.00–2.50			≤3.00	
2	4.01	3.70				>2.00	>2.00			>1.00
		2.64				>2.00		>3.50		≤1.00
3	3.93	3.66				>2.00				>1.00
		2.69				>2.00	≤2.00			
Hispanic/Latino										
1	7.15	4.75	Female				>1.83			>1.00
		2.89		≤5.00			≤1.83	>3.50		
2	6.59	4.31	Female				>1.83		≤2.33	
		3.08		≤5.00			≤1.83	>3.33		
3	5.34	4.20	Female				>1.83			>1.00
		3.10	Male				≤1.83	≤3.50		
4	4.29	4.80	Female				>1.83	≤2.83		
		2.92	Male		≤1.00				≤2.33	
5	4.01	4.30					>1.83		>3.00	≥1.00
		3.20					≤1.83	2.67–3.33		

Note: Parents’ language did not appear in any trees

Table 3). Adolescent sex, school size, school contact, academic socialization, home-based involvement, and school-based involvement each appeared in at least one tree. The tree with the highest proportion of variance included adolescent sex, school size, academic socialization, home-based involvement, and school-based involvement. Academic socialization and home-based involvement were the most common factors across the trees (both in all five trees). The combination of academic socialization and school-based involvement appeared in three trees—more academic socialization and more school-based involvement were associated with higher GPA. The combination of academic socialization and home-based involvement appeared across trees, but findings were mixed—higher, lower, and moderate levels of home-based involvement, in combination with less academic socialization, adolescent sex, and school size were associated with lower GPA. In one tree, a three-way interaction of parental educational involvement strategies emerged; greater academic socialization, home-based involvement, and school-based involvement were associated with higher GPA. Several three-way interactions also emerged among adolescent characteristics, school factors, and involvement strategies: sex × academic socialization × home-based involvement (three trees), school size × academic socialization × home-based involvement (two trees), and sex × school contact × home-based involvement (one tree).

For white adolescents, the proportion of variance explained by trees ranged from 6.27 to 13.19% (see Table 4). Adolescent sex, school size, school contact, academic socialization, home-based involvement, and school-based involvement each appeared in at least one tree. The tree with the highest proportion of variance included adolescent sex, school contact, academic socialization, and home-based involvement. The combination of academic socialization and home-based involvement appeared in nine trees, along with school contact—more academic socialization and less home-based involvement were associated with higher GPA and less academic socialization and more home-based involvement were associated with lower GPA. The combination of academic socialization and school-based involvement appeared in one tree along with school contact—more academic socialization and more school-based involvement were associated with higher GPA. In one tree, the three-way interaction of less academic socialization, more home-based involvement, and zero school-based involvement was associated with lower GPA. There also were multiple three-way interactions among adolescent characteristics, school factors, and involvement strategies: sex × school contact × academic socialization (eight trees), school contact × academic socialization × home-based involvement (four trees), school contact × school size × academic socialization (three trees), sex × school size × academic socialization (two trees), and school contact ×

Table 4 Recursive partitioning analyses for White adolescents—grade point average

Tree	R ²	GPA	Sex	School size	School contact	Academic socialization Adolescent report	Home-based involvement		School-based involvement
							Parent report	Adolescent report	
1	13.19	5.01	Female		>1.00	>1.83			
		3.25			≤1.00	≤1.83		>2.25	
2	11.08	4.72			>1.00	>1.83			≥1.00
		3.38			≤1.00	≤1.83		>3.38	
3	11.07	5.03	Female		>1.00			≤3.33	
		3.63			≤1.00	≤1.83			
4	11.00	4.82	Female	≤1.00		>1.83			
		3.35				≤1.00	≤1.83	2.67–3.33	
5	10.21	4.92	Female		>1.00	>1.83			
		3.36		Male		≤1.00	≤1.83		
6	9.76	4.91	Female		>1.00	>1.83			
		3.44				≤1.00	≤1.83		>2.18
7	8.88	5.02	Female		>1.00	>1.83			
		3.63		>3.00		≤1.00	≤1.83		
8	7.42	4.83			>1.00	>2.17			
		3.64	>1.00		≤1.00	≤1.83			
9	7.09	4.83	Female		>1.00	>1.83			
		3.53		Male			≤1.83		>2.25
10	7.08	4.91	Female		>1.00	>1.83			
		3.71		>1.00		≤1.00	≤1.83		
11	6.95	4.92	Female		>1.00	>1.83			
		3.81		Male		≤1.00		≤3.33	
12	6.75	4.80			>1.00	>2.33			
		3.58			≤1.00	≤1.83		>2.25	
13	6.27	4.83	Female	≤1.00		>1.83			
		3.64		Male			≤1.83		>2.25

Note: Parents’ language did not appear in any trees

academic socialization × school-based involvement (one tree).

Parental Educational Involvement and Educational Attainment

A total of 27 trees met the criteria to represent the final forests of trees for educational attainment: ten trees for African American adolescents, seven trees for Hispanic/Latino adolescents, and ten trees for white adolescents. The proportion of variance explained across these trees ranged from 6.29% to 26.87%. The trees for white and Hispanic/Latino adolescents explained a greater overall proportion of variance compared to trees for African American adolescents. Adolescent GPA, school size, academic socialization, home-based involvement, and school-based involvement appeared across all forests. A higher GPA was consistently associated with greater educational attainment, and a lower

GPA was consistently associated with less educational attainment. Differences emerged between racial/ethnic groups regarding associations among other factors.

As shown in Table 5, for African American adolescents, the proportion of variance explained by trees ranged from 6.29% to 16.52%. Grade point average, school size, school contact to parents, academic socialization, home-based involvement, and school-based involvement each appeared in at least one tree. The tree with the highest proportion of variance included GPA only. Parental educational involvement strategies appeared in combination in several trees; greater academic socialization in combination with greater home-based involvement was associated with higher educational attainment, and greater home-based involvement in combination with greater school-based involvement was also associated with higher attainment.

For Hispanic/Latino adolescents, the proportion of variance explained by trees ranged from 11.99% to 25.15%

Table 5 Recursive partitioning analyses for African American adolescents—educational attainment ($N = 313$)

Tree	R ²	Educational attainment	GPA	School size	School contact	Academic socialization		Home-based involvement		School-based involvement
						Parent report	Adolescent report	Parent report	Adolescent report	
1	16.52	5.48	>4.00							
		3.16	≤2.00							
2	13.92	4.77	>4.00							
		3.26	≤2.00				≤2.00			
3	11.40	4.91	>4.00							
		3.43	≤2.00							0.00
4	10.79	4.53	>2.00				>1.83		>2.83	
		3.27	≤2.00							
5	9.21	4.77	>4.00							
		3.44	≤2.00				>1.83			
6	8.74	4.71	>3.00					>3.00		>1.00
		3.05	≤2.00				≤2.40			
7	7.43	5.14	>4.00							
		3.33	≤4.00				≤1.83			
8	7.27	5.00	>3.00		1.00					≥1.00
		3.23	≤3.00				≤1.83			
9	6.39	4.80	>3.00	≤2.00						
		3.28	≤3.00				≤2.40	≤3.67		
10	6.29	4.71	>4.00							
		3.30	≤4.00			≤2.00	≤2.00			

Note: Sex and parents' language did not appear in any trees

(see Table 6). GPA, adolescent sex, school size, academic socialization, home-based involvement, and school-based involvement each appeared in at least one tree. The tree with the highest proportion of variance included GPA, school size, and academic socialization. The combination of academic socialization and home-based involvement appeared in one tree—less academic socialization and less home-based involvement were associated with lower attainment.

For white adolescents, the proportion of variance explained by trees ranged from 17.22 to 26.87% (see Table 7). Grade point average, school size, academic socialization, home-based involvement, and school-based involvement each appeared in at least one tree. The tree with the highest proportion of variance included GPA and academic socialization. The combination of academic socialization and home-based involvement appeared in one tree—more academic socialization and less home-based involvement were associated with higher educational attainment.

Discussion

Given the persistent disparities in educational attainment in the United States (NCES 2016a, 2016b), professionals and

policymakers have encouraged parents to be more involved in their adolescents' academic lives as an important way to improve academic outcomes. However, research findings have remained unclear regarding the strategies that support adolescents, particularly across racial/ethnic groups. Therefore, the main goal of this article was to use recursive partitioning analyses to explore which combinations of parental educational involvement strategies were associated with academic outcomes for a racially/ethnically diverse group of adolescents from low-income families.

Importantly, findings showed that combinations of parental educational involvement strategies were associated with academic outcomes across racial/ethnic groups (see Table 8 for a summary). These findings extend previous quantitative work that has focused solely on parental educational involvement as a single, broad parenting behavior (e.g., Kuperminc et al. 2008), or has examined multiple types of involvement independently predicting outcomes (e.g., Bhargava and Witherspoon 2015). Findings also showed three-way interactions among parental educational involvement strategies, adolescent characteristics, and school characteristics (i.e., sex by academic socialization by home-based involvement for Hispanic/Latino adolescents or school contact by academic socialization by home-based involvement for African American adolescents). The focus

Table 6 Recursive partitioning analyses for Hispanic/Latino adolescents—educational attainment ($N = 448$)

Tree	R ²	Educational attainment	GPA	Sex	School size	Academic socialization Adolescent report	Home-based involvement		School-based involvement
							Parent report	Adolescent report	
1	25.15	5.36	>4		≤5				
		3.07	≤3			≤1.83			
2	24.02	5.15	>4		≤5				
		2.93	≤4	Female		≤1.83			
3	23.33	5.38	>4						0
		3.07	≤3					≤3.00	
4	19.95	4.89	>4		≤5				
		2.79	≤3				≤2.67		
5	17.98	5.11	>4						
		2.86	≤4	Male		≤1.83	≤3.33		
6	14.13	5.20	>4			≤2.17			
		3.13	≤4			≤1.83		≤2.33	
7	11.99	4.86	>4						
		3.00	≤3			≤1.83	>3.33		

Note: School contact, academic socialization—parent report, and parents’ language did not appear in any trees

Table 7 Recursive partitioning analyses for White adolescents—educational attainment ($N = 1370$)

Tree	R ²	Educational attainment	GPA	School size	Academic socialization Adolescent report	Home-based involvement Adolescent report	School-based involvement	
							Parent report	Adolescent report
1	26.87	6.00	>5		>2.20			
		2.95	≤3		≤1.83			
2	24.64	5.81	>5	>1				
		2.9	≤3		≤1.83			
3	24.18	5.74	>5		>2.20			
		3.09	≤3					≥1
4	23.53	5.83	>5			>2.33		
		3.13	≤3			≤2.83		
5	22.47	5.719	>5		>2.20			
		3.06	≤3	>3				
6	21.93	5.62	>4		>2.20	≤2.83		
		3.00	≤3		≤1.83			
7	20.70	5.83	>5			>2.33		
		3.15	≤3		≤1.83			
8	20.67	5.79	>5		>2.17			
		3.08	≤3					0
9	18.83	5.61	>5		>2.20			
		3.10	≤3					0
10	17.22	5.68	>5					≥1
		3.05	≤3		≤1.83			

Note: Sex, school contact, academic socialization—parent report, home-based involvement—parent report, and parents’ language did not appear in any trees

Table 8 Summary of findings for combinations of parental educational involvement strategies across racial/ethnic groups

Combinations of strategies				
	Academic socialization + school-based	Home-based + academic socialization	Home-based + school-based	3-way combinations
GPA				
African American	>AS + >school → >GPA	<Home + moderate AS → <GPA	–	>AS + >home + <school → <GPA
Hispanic/Latino	>AS + >school → >GPA ^a	No consistent combinations	–	>AS + >school + >home → >GPA
White	>AS + >school → >GPA ^b	<Home + >AS → >GPA	–	<AS + 0 school + >home → <GPA
Educational attainment				
African American	–	>Home + >AS → >attain	>Home + >school → >attain	–
Hispanic/Latino	–	<Home + <AS → <attain	–	–
White	–	>Home + <AS → >attain	–	–

Note: AS = academic socialization, > = higher levels, < = lower levels

^aParticularly for females

^bParticularly when there was more school contact

of this study was on combinations of parental educational involvement strategies, but these differences in individual and school factors related to academic outcomes are important considerations for future work.

Across racial/ethnic groups, the combination of greater academic socialization and greater school-based involvement was beneficial for adolescent GPA, particularly among female Hispanic/Latino adolescents and white adolescents with higher levels of school contact. These findings align with previous work noting the benefits of both academic socialization and school-based involvement (e.g., Hill and Tyson 2009), but further suggest that the combination of these strategies may be particularly beneficial. School-based involvement is a more direct form of involvement compared to academic socialization, as it offers parents direct interaction with the school and may model to adolescents that school activities are “...worthy of adult interest and time” (Epstein 2001; Hoover-Dempsey and Sandler 1995; 1997). If adolescents are receiving these messages at home via academic socialization *and* by seeing their parents participate at school, they may be more likely to perceive school as a priority to their parents and prioritize academic achievement themselves. Interestingly, this combination of strategies did not appear at all for educational attainment; although previous work has shown independent links between each strategy and educational attainment (e.g., Benner et al. 2016), our findings show that the combined benefits of these strategies seem to be most salient for proximal academic outcomes.

The combination of home-based involvement and academic socialization yielded mixed results across racial/ethnic groups—more home-based involvement combined with more academic socialization was particularly beneficial for

African American and Hispanic/Latino adolescents. Among African American adolescents, less home-based involvement combined with moderate levels of academic socialization was associated with lower GPA, and greater home-based involvement combined with greater academic socialization was associated with higher levels of educational attainment. Among Hispanic/Latino adolescents, there were no consistent combinations of home-based involvement and academic socialization that contributed to GPA, but less home-based involvement and less academic socialization were associated with lower levels of educational attainment. These findings align with previous qualitative work exploring the multiple parental educational involvement strategies used by working-class parents of color (e.g., Auerbach 2007). In particular, Suizzo and colleagues (2012) reported that low-income, Mexican-origin parents provided positive messages about school or having conversations with their adolescents about school while also creating a positive learning environment at home.

Interestingly, for white adolescents, the combination of home-based involvement and academic socialization was in the opposite direction compared to African American adolescents. For white adolescents, the combination of more academic socialization and *less* home-based involvement was associated with higher levels of GPA and educational attainment. This difference may reflect cultural differences in how adolescents interpret parents’ home-based strategies. In this study, home-based involvement included help with homework, as well as rules and structure at home. As noted by Wang and Sheikh-Khalil (2014), African American adolescents may respond more positively to “no-nonsense” parenting compared to white adolescents because African American youth may benefit from structure and strict

parenting. Brody and Murry (2001) described no-nonsense parenting used by African American mothers in their study of single-mother headed families living in the rural south as a style that includes a mixture of high levels of vigilant control with high levels of support. African American parents may also engage in greater levels of active involvement with or control over their adolescents' activities at home (Suizzo et al. 2016). Parents' home-based involvement characterized by greater structure or controlling strategies may be perceived as normative by African American adolescents yet may be perceived as an infringement on autonomy by white adolescents (Smetana and Chuang 2001; Wang et al. 2014) which may also explain the difference in the direction of effects between African American and white adolescents.

Findings also showed three-way combinations of factors associated with adolescent GPA that differed across racial/ethnic groups. Importantly, these different combinations of factors are evidence that more involvement overall is not always better for adolescents (Pomerantz et al. 2007). Among African American adolescents, more academic socialization, more home-based involvement, and lower levels of school-based involvement, were linked to lower GPA. This combination suggests that school-based involvement may be a particularly important factor for African American youth. School-based involvement appeared across trees most consistently for African American adolescents and this three-way interaction suggests that if school-based involvement is low, it is very difficult to buffer the negative effects for GPA, even if academic socialization and home-based involvement are high. Among Hispanic/Latino adolescents, the combination of more academic socialization, more home-based involvement and more school-based involvement was associated with higher GPA. This combination suggests that greater overall levels of involvement may benefit Hispanic/Latino adolescents. Among white adolescents, less academic socialization, zero school-based involvement, and more home-based involvement were associated with lower GPA; a combination consistent with findings from the two-way interactions suggesting the benefits of academic socialization and school-based involvement and drawbacks of home-based involvement for white adolescents.

Finally, although not an intended focus of this study, it is important to note the role of reporter in the associations among parental educational involvement, GPA, and educational attainment. Previous work has established the importance of considering reporter for a wide range of aspects of parent-adolescent relationships (e.g., Dotterer and Wehrspann 2016a, b). Findings in the current study suggest that these differences may also be meaningful for parental educational involvement strategies, as differences surfaced between reporters in the links between involvement and

academic outcomes. Adolescent reports of involvement appeared far more across racial/ethnic groups than parent reports, suggesting that the adolescents' perception of involvement may be more meaningful for academic outcomes than parent reports. This was particularly true for Hispanic/Latino and white adolescents, indicating there may be different implications of reporter discrepancies between racial/ethnic groups. Future work that explores these differences may help disentangle these findings.

This study contributes to existing parental educational involvement literature by illuminating the different combinations of factors associated with academic outcomes for adolescents from low-SES families, combinations that have not previously been explored and have implications for future research, policy, and practice. There appear to be meaningful differences between racial/ethnic groups of low-income adolescents for which combinations of parental educational involvement strategies are beneficial. Therefore, future longitudinal studies of parental educational involvement would benefit from incorporating the combined effects of multiple facets of parental educational involvement, rather than focusing on independent associations between involvement and academic outcomes. Intervention studies incorporating combinations of factors may provide evidence of a causal association between parental educational involvement strategies and academic outcomes or shed light on intermediary factors linking parental involvement and academic outcomes. These studies may be particularly helpful for disentangling the role of home-based involvement; home-based involvement may be best understood in combination with other parental educational involvement strategies rather than studied as a stand-alone practice.

Future policy and practice may also benefit from the findings of this study. Oftentimes, legislation and school policy provide broad, vague references to parental educational involvement, encouraging parents generally to "be more involved." This study provides evidence of the many factors that differ in their association with academic outcomes across race/ethnicity, challenging the notion of one-size-fits-all parental involvement. Further, parents often have limited time and resources—by focusing efforts on encouraging combinations of parenting strategies that seem to most be related to academic outcomes for adolescents, there may be a greater return on investment for adolescents' success.

Despite the many strengths of the study, there are several limitations to note. While this study explored meaningful differences between adolescents of different race/ethnicities, it did not explore possible community characteristics (e.g., urban vs rural communities or differences in community resources such as college preparation programs or access to a college campus) or parent-adolescent relationship factors (warmth and conflict) that may interact with race/ethnicity.

This may be particularly true for school outreach efforts, as school contact appeared in several trees, especially for white adolescents, and may help explain why trees for African American and Hispanic/Latino adolescents explained less variance in GPA compared to trees for white adolescents. This is an area that would benefit from further research. This study used recursive partitioning to explore higher order combinations of factors associated with academic outcomes. While innovative, this approach also provided challenges for interpreting results; recursive partitioning does not provide a straightforward method to calculate effect sizes and confidence intervals. Future studies should replicate these recursive partitioning analyses with other populations of adolescents. Finally, the focus of this study was on the quantity of involvement, rather than quality. Future qualitative work may address this limitation to provide a greater understanding of the content and quality of these parent-adolescent interactions.

Conclusion

Findings from the current study suggest that combinations of parental educational involvement strategies are associated with adolescents' academic outcomes differently across racial/ethnic groups. The combination of greater academic socialization and school-based involvement was beneficial for all adolescents' grade point averages, whereas the combination of home-based involvement with academic socialization and school-based involvement yielded mixed results. Greater academic socialization and home-based involvement appeared beneficial for African American and Hispanic/Latino adolescents' educational attainment (i.e.,

total years of schooling completed). For white adolescents, more home-based involvement and less academic socialization were associated with less educational attainment. These results are further evidence that although parental educational involvement tends to decline as children age, it continues to be an important means of support for high school students' academic outcomes.

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Authors' Contributions Both authors made substantial contributions to this study. E.D. conceived of the study, performed the statistical analyses, and drafted the manuscript. A.D. participated in the design and interpretation of the data, as well as revising the manuscript. Both authors read and approved the final manuscript.

Data Sharing Declaration The datasets analyzed during the current study are publicly available from the U.S. Institute of Education Sciences, National Center for Education Statistics at https://nces.ed.gov/surveys/els2002/avail_data.asp.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval The study design and use of the Education Longitudinal Study of 2002 data were approved by the Purdue Institutional Review Board (protocol #1601016989).

Informed Consent All data used in these analyses came from the publicly available Education Longitudinal Study of 2002 conducted by the National Center for Education Statistics. Prior to data collection, state and district leaders consented to school participation and the sampling of students. Prior to questionnaire and test administration to students, parents were sent consent letters to notify them about the study. The full details regarding data collection procedures can be found here: <https://nces.ed.gov/pubs2004/2004405.pdf>.

Appendix

Summary of parental educational involvement measures for adolescents and parents at base year

	Adolescent		Parent	
	Question	Scale	Question	Scale
Home-based involvement	How often do your parents do the following? - Check on whether you have done your homework - Help you with your homework - Give you privileges as a reward for good grades - Limit privileges because of poor grades - Limit the amount of time watching TV/playing video games - Limit the amount of time going out with friends on school nights	1 – never 2 – rarely 3 – sometimes 4 – often	How often do you... - Check that your tenth grader has completed homework? - Make and enforce curfews for your tenth grader on school nights? Looking back over the past year, how frequently did you and your tenth grader participate in the following activities together? - Working on homework or other school projects	1 – never 2 – seldom 3 – usually 4 – always 1 – never 2 – rarely 3 – sometimes 4 – frequently
School-based involvement	N/A		Do you and your spouse/partner do any of the following? - Belong to the school's parent-teacher organization - Attend meetings of the parent-teacher organization - Take part in activities of the parent-teacher organization - Act as a volunteer at the school	0 – no 1 – yes
Academic socialization	How often have you discussed the following with either or both of your parents or guardians? - Selecting courses or programs at school - School activities or events of particular interest to you - Things you've studied in class - Your grades - Plans and preparation for ACT or SAT tests - Going to college	1 – never 2 – sometimes 3 – often	How often have you and/or your spouse/partner provided advice or information about the following to your tenth grader? - Selecting courses or programs at school - Plans and preparation for college entrance exams such as ACT, SAT or ASVAB - Applying to colleges or other schools after high school - Specific jobs your tenth grader might apply for after high school	1 – never 2 – sometimes 3 – often

References

- Anguiano, R. P. V. (2004). Families and schools: The effect of parental involvement on high school completion. *Journal of Family Issues*, 25(1), 61–85. <https://doi.org/10.1177/0192513x03256805>.
- Auerbach, S. (2007). From moral supporters to struggling advocates reconceptualizing parent roles in education through the experience of working-class families of color. *Urban Education*, 42(3), 250–283. <https://doi.org/10.1177/0042085907300433>.
- Benner, A. D., Boyle, A. E., & Sadler, S. (2016). Parental involvement and adolescents' educational success: The roles of prior achievement and socioeconomic status. *Journal of Youth and Adolescence*, 45(6), 1053–1064. <https://doi.org/10.1007/s10964-016-0431-4>.
- Bhargava, S., & Witherspoon, D. P. (2015). Parental involvement across middle and high school: Exploring contributions of individual and neighborhood characteristics. *Journal of Youth and Adolescence*, 44(9), 1702–1719. <https://doi.org/10.1007/s10964-015-0334-9>.
- Biggs, D., De Ville, B., & Suen, E. (1991). A method of choosing multiway partitions for classification and decision trees. *Journal of Applied Statistics*, 18(1), 49–62. <https://doi.org/10.1080/02664769100000005>.
- Brody, G. H., & Murry, V. M. (2001). Sibling socialization of competence in rural, single-parent African American families. *Journal of Marriage and Family*, 63, 996–1008. <https://doi.org/10.1111/j.1741-3737.2001.00996.x>.
- Carnevale, A. P., Smith, N., & Strohl, J. (2013). *Recovery: Job growth and education requirements through 2020*. Center on Education and the Workforce, Georgetown University, Washington, DC.
- Catsambis, S. (2001). Expanding knowledge of parental involvement in children's secondary education: Connections with high school seniors' academic success. *Social Psychology of Education*, 5(2), 149–177. <https://doi.org/10.1023/A:1014478001512>.
- Cheung, C. S. S., & Pomerantz, E. M. (2012). Why does parents' involvement enhance children's achievement? The role of parent-oriented motivation. *Journal of Educational Psychology*, 104(3), 820–832. <https://doi.org/10.1037/a0027183>.
- Christopher, E. (2017). *NCES handbook of survey methods: Education longitudinal study of 2002*. <https://nces.ed.gov/statprog/handbook/pdf/els.pdf>.
- Dotterer, A. M., & Wehrspann, E. (2016a). Parent involvement and academic outcomes among urban adolescents: Examining the role of school engagement. *Educational Psychology*, 36(4), 812–830.
- Dotterer, A. M., & Wehrspann, E. (2016b). Parental knowledge: Examining reporter discrepancies and links to school engagement among middle school studies. *Journal of Youth and Adolescence*, 45, 2431–2443. <https://doi.org/10.1007/s10964-016-0550-y>.
- Eccles, J. S., & Harold, R. D. (1995). Family involvement in children's and adolescents' schooling. In A. Booth & J. F. Dunn (Eds.), *Family-school links: How do they affect educational outcomes?* (pp. 3–34). Mahwah, NJ: Lawrence Erlbaum Associates.
- Epstein, J. L. (2001). *School, family, and community partnerships: Preparing educators and improving schools*. Boulder, CO: Westview Press.
- Falbo, T., Lein, L., & Amador, N. A. (2001). Parental involvement during the transition to high school. *Journal of Adolescent Research*, 16(5), 511–529. <https://doi.org/10.1177/0743558401165006>.
- García-Coll, C., Crnic, K., Lamberty, G., Wasik, B. H., Jenkins, R., García, H. V., & McAdoo, H. P. (1996). An integrative model for the study of developmental competencies in minority children. *Child Development*, 67(5), 1891–1914. <https://doi.org/10.2307/1131600>.
- Gonzalez-DeHass, A. R., Willems, P. P., & Holbein, M. F. D. (2005). Examining the relationship between parental involvement and student motivation. *Educational Psychology Review*, 17(2), 99–123. <https://doi.org/10.1007/s10648-3949-7>.
- Gordon, M. S., & Cui, M. (2012). The effect of school-specific parenting processes on academic achievement in adolescence and young adulthood. *Family Relations*, 61(5), 728–741. <https://doi.org/10.1111/j.1741-3729.2012.00733.x>.
- Gruenewald, T. L., Mroczek, D. K., Ryff, C. D., & Singer, B. H. (2008). Diverse pathways to positive and negative affect in adulthood and later life: an integrative approach using recursive partitioning. *Developmental Psychology*, 44(2), 330–343. <https://doi.org/10.1037/0012-1649.44.2.330>.
- Gruenewald, T. L., Seeman, T. E., Ryff, C. D., Karlamangla, A. S., & Singer, B. H. (2006). Combinations of biomarkers predictive of later life mortality. *Proceedings of the National Academy of Sciences*, 103(38), 14158–14163. <https://doi.org/10.1073/pnas.0606215103>.
- Hayes, D. (2011). Predicting parental home and school involvement in high school African American adolescents. *The High School Journal*, 94(4), 154–166. <https://doi.org/10.1353/hsj.2011.0010>.
- Hill, N. E., Castellino, D. R., Lansford, J. E., Nowlin, P., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2004). Parent academic involvement as related to school behavior, achievement, and aspirations: Demographic variations across adolescence. *Child Development*, 75(5), 1491–1509. <https://doi.org/10.1111/j.1467-8624.2004.00753.x>.
- Hill, N. E., & Chao, R. K. (2009). Background in theory, practice, and policy. In N. E. Hill & R. K. Chao (Eds.), *Families, schools, and the adolescent* (pp. 1–15). New York, NY: Teachers College Press.
- Hill, N. E., & Torres, K. (2010). Negotiating the American dream: The paradox of aspirations and achievement among Latino students and engagement between their families and schools. *Journal of Social Issues*, 66(1), 95–112. <https://doi.org/10.1111/j.1540-4560.2009.01635.x>.
- Hill, N. E., & Tyson, D. F. (2009). Parental involvement in middle school: A meta-analytic assessment of the strategies that promote achievement. *Developmental Psychology*, 45(3), 740–763. <https://doi.org/10.1037/a0015362>.
- Hoover-Dempsey, K. V., & Sandler, H. (1995). Parental involvement in children's education: Why does it make a difference? *The Teachers College Record*, 97(2), 310–331.
- Hoover-Dempsey, K. V., & Sandler, H. M. (1997). Why do parents become involved in their children's education? *Review of Educational Research*, 67(1), 3–42. <https://doi.org/10.3102/00346543067001003>.
- IBM Corp. Released. (2013). *IBM SPSS Statistics for Windows, Version 22.0*. Armonk, NY: Corp.
- Ingels, S. J., Pratt, D. J., Alexander, C. P., Jewell, D. M., Lauff, E., Mattox, T. L., & Wilson, D. (2014). *Educational longitudinal study of 2002 (ELS: 2002) third follow-up data file documentation (NCES 2014-364)*. Washington, DC: U.S. Department of Education.
- Jeynes, W. H. (2007). The relationship between parental involvement and urban secondary school student academic achievement: a meta-analysis. *Urban Education*, 42, 82–110. <https://doi.org/10.1177/0041085806293818>.
- Kuperminc, G. P., Darnell, A. J., SpringerAmpamp; Alvarez-Jimenez, A. (2008). Parent involvement in the academic adjustment of Latino middle and high school youth: Teacher expectations and school belonging as mediators. *Journal of Adolescence*, 31(4), 469–483. <https://doi.org/10.1016/j.adolescence.2007.09.003>.
- Lareau, A. (2011). *Unequal childhoods: Class, race, and family life*. Berkeley, CA: University of California Press.

- Mistry, R. S., White, E. S., Benner, A. D., & Huynh, V. W. (2009). A longitudinal study of the simultaneous influence of mothers' and teachers' educational expectations on low-income youth's academic achievement. *Journal of Youth and Adolescence*, 38(6), 826–838. <https://doi.org/10.1007/s10964-008-9300-0>.
- Murrell, S. A., Salsman, N. L., & Meeks, S. (2003). Educational attainment, positive psychological mediators, and resources for health and vitality in older adults. *Journal of Aging and Health*, 15(4), 591–615. <https://doi.org/10.1177/0898264303256198>.
- National Center for Education Statistics. (2016a). *Digest of education statistics*. https://nces.ed.gov/programs/digest/2016menu_tables.asp.
- National Center for Education Statistics. (2016b). *The nation's report card*. https://www.nationsreportcard.gov/reading_math_2015/#reading/groups?grade=8.
- National Center for Education Statistics. (2017). *The condition of education 2000*. Washington, DC: Office of Educational Research and Improvement, U.S. Department of Education.
- Pomerantz, E. M., Altermatt, E. R., & Saxon, J. L. (2002). Making the grade but feeling distressed: Gender differences in academic performance and internal distress. *Journal of Educational Psychology*, 94(2), 396–404. <https://doi.org/10.1037/0022-0663.94.2.396>.
- Pomerantz, E. M., Moorman, E. A., & Litwack, S. D. (2007). The how, whom, and why of parents' involvement in children's academic lives: More is not always better. *Review of Educational Research*, 77, 373–410. <https://doi.org/10.3102/00346530305567>.
- Purpura, D. J., Day, E., Napoli, A. R., & Hart, S. A. (2017). Identifying domain-general and domain-specific predictors of low mathematics performance: A classification and regression tree analysis. *Journal of Numerical Cognition*, 3(2), 365–399. <https://doi.org/10.5964/jnc.v3i2.53>.
- Reynolds, A. D., Crea, T. M., Medina, J., Degnan, E., & McRoy, R. (2015). A mixed-methods case study of parent involvement in an urban high school serving minority students. *Urban Education*, 50(6), 750–775. <https://doi.org/10.1177/0042085914534272>.
- Rowan-Kenyon, H. T., Bell, A. D., & Perna, L. W. (2008). Contextual influences on parental involvement in college going: Variations by socioeconomic class. *The Journal of Higher Education*, 79(5), 564–586. <https://doi.org/10.1353/jhe.0.0020>.
- Smetana, J., & Chuang, S. (2001). Middle-class African American Parents' conceptions of parenting in early adolescence. *Journal of Research on Adolescence*, 11(2), 177–198. <https://doi.org/10.1111/1532-7795.00009>.
- Speybroeck, N. (2012). Classification and regression trees. *International Journal of Public Health*, 57(1), 243–246. <https://doi.org/10.1007/s00038-011-0315-z>.
- Stewart, E. B. (2008). School structural characteristics, student effort, peer associations, and parental involvement the influence of school-and individual-level factors on academic achievement. *Education and Urban Society*, 40(2), 179–204. <https://doi.org/10.1177/0013124507304167>.
- Strobl, C., Malley, J., & Tutz, G. (2009). An introduction to recursive partitioning: rationale, application, and characteristics of classification and regression trees, bagging, and random forests. *Psychological Methods*, 14(4), 323–348. <https://doi.org/10.1037/a0016973>.
- Suizzo, M. A., Jackson, K. M., Pahlke, E., Marroquin, Y., Blondeau, L., & Martinez, A. (2012). Pathways to achievement: How low-income Mexican-origin parents promote their adolescents through school. *Family Relations*, 61(4), 533–547. <https://doi.org/10.1111/j.1741-3729.2012.00727.x>.
- Suizzo, M. A., Jackson, K. M., Pahlke, E., McClain, S., Marroquin, Y., Blondeau, L. A. & Hong, K. (2015). Parents' school satisfaction and academic socialization predict adolescents' autonomous motivation: A mixed-method study of low-income ethnic minority families. *Journal of Adolescent Research*, 31(3), 343–374. <https://doi.org/10.1177/0743558415605617>.
- Suizzo, M. A., Pahlke, E., Chapman-Hilliard, C., & Harvey, K. E. (2016). African American and Mexican American youths' college adjustment and perceptions of parental academic socialization: Interactions between ethnicity and parental education. *Research in Human Development*, 13, 241–257. <https://doi.org/10.1080/1527609.2016.1194709>.
- Toldson, I. A., & Lemmons, B. P. (2013). Social demographics, the school environment, and parenting practices associated with parents' participation in schools and academic success among Black, Hispanic, and White students. *Journal of Human Behavior in the Social Environment*, 23(2), 237–255. <https://doi.org/10.1080/10911359.2013.747407>.
- U.S. Department of Commerce. (2011). *Overview of race and Hispanic origin: 2010*. 2010 Census Briefs, March Issue. <https://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf>.
- Wang, M. T., & Sheikh-Khalil, S. (2014). Does parental involvement matter for student achievement and mental health in high school? *Child Development*, 85(2), 610–625. <https://doi.org/10.1111/cdev.12153>.
- Wang, M. T., Hill, N. E., & Hofkens, T. (2014). Parental involvement and African American and European American adolescents' academic, behavioral, and emotional development in secondary school. *Child Development*, 85(6), 2151–2168. <https://doi.org/10.1111/cdev.12284>.
- Wehrspann, E., Dotterer, A. M., & Lowe, K. (2015). The nature of parental involvement in middle school: Examining nonlinear associations. *Contemporary School Psychology*, 20(3), 193–204. <https://doi.org/10.1007/s40688-015-0071-9>.
- Williams, T. T., & Sánchez, B. (2012). Parental involvement (and uninvolvement) at an inner-city high school. *Urban Education*, 47(3), 625–652.
- Yan, W., & Lin, Q. (2005). Parent involvement and mathematics achievement: Contrast across racial and ethnic groups. *The Journal of Educational Research*, 99(2), 116–127. <https://doi.org/10.3200/joer.99.2.116>.
- Zhang, Y., Haddad, E., Torres, B., & Chen, C. (2011). The reciprocal relationships among parents' expectations, adolescents' expectations, and adolescents' achievement: A two-wave longitudinal analysis of the NELS data. *Journal of Youth and Adolescence*, 40(4), 479–489. <https://doi.org/10.1007/s10964-010-9568-8>.

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