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Hispanics' SAT Scores: The Influences of Level of Parental Education, Performance-Avoidance Goals, and Knowledge about Learning.

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Abstract

This study uncovers which learning (epistemic belief of learning), socio-economic background (level of parental education, family income) or social-personality factors (performance-avoidance goals, test anxiety) mitigate the ethnic gap in SAT scores. Measures assessing achievement motivation, test anxiety, socio-economic family background, and epistemic belief of learning were administered to 143 European-American and 62 Hispanic students. Analysis of covariance revealed that the measures of epistemic belief of learning, performance-avoidance goals, and level of parental education each had a unique influence on combined SAT (SAT-V + SAT-M), SAT-V, and SAT-M scores. Indeed, the statistical removal of these influences resulted in the elimination of 55% to 75% of the effect attributed to ethnic differences in SAT performance. Moreover, even when gender differences were controlled the analysis of covariance revealed the same results. Taken as a whole, these results suggest that multiple factors influence ethnic differences in SAT performance.

Keywords

SAT; ethnic differences; performance-avoidance goals; parental education

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Information about Author

Dr. Hannon attained her Masters and Ph.D. in Psychology at the University of Toronto, Toronto, Ontario. As a doctoral student at the University of Toronto, Dr. Hannon developed and validated (with Dr. Meredyth Daneman) a new measure that assesses the higher-level comprehension processes that are tapped by measures of adult reading comprehension ability. Since her doctoral days, Dr. Hannon has completed a number of other psychometrically- and statistically-complicated studies. For example, Hannon and Frias' study (2012) involved developing and validating a psychometric measure of higher-level comprehension processes that is suitable for preschoolers. Additionally, Hannon (2012) involved multiple psychological measures and very sophisticated statistical analyses, including structural equation models, regression analyses, and factor analyses that tested many of the assumptions of multiple theories of reading comprehension.

With respect to SAT-based research Dr. Hannon has published two manuscripts; one manuscript examining the contributions of social/personality and learning/cognitive factors to SAT-V, SAT-M, overall SAT scores (Hannon & McNaughton-Cassill, 2011) and another article examining gender differences in SAT-V, SAT-M, and overall SAT scores (Hannon, 2012b).

Dr. Hannon currently teaches Statistics, Psychology of Language, and Introduction to Learning at Texas A&M University-Kingsville.

Footnotes

1. Introduction

“For students in the United States the SAT (i.e., the Scholastic Assessment Test) is one of the most, if not *the most*, important measure of academic achievement because of its dominant role in high stakes decisions of college admissions” (Hannon, 2012, pp. 816). Indeed, a recent survey of multiple institutions indicates that ninety percent of them consider the SAT to be of “moderate” or “considerable” importance in the admission process (Clinedinst & Hawkins, 2010; see also Zwick, 2012). Nevertheless the SAT is also inundated with controversies, such as those associated with gender and ethnic differences (Hannon, 2012). In fact, research suggests that the SAT scores for females and ethnic/racial minorities are consistently lower (Kobrin, Sathy, & Shaw, 2007), thus potentially reducing opportunities for university and college admissions. This latter controversy—ethnic differences in SAT performance—is central to the present study because the main objective here is to ascertain if learning, socio-economic family background, and social-personality factors explain ethnic differences in the verbal SAT (i.e., SAT-V), math SAT (i.e., SAT-M), and combined SAT (i.e., SAT-V + SAT-M) scores. These three content areas were selected because their measures (e.g., parental education, family income, test anxiety, and epistemic belief of learning) explain variance in SAT scores (e.g., Daneman & Hannon, 2001; Hannon & McNaughton-Cassill, 2011; Zwick, 2007). As a result, one or more measures from these three content areas might also explain why differences in ethnicity exist for the SAT- V, SAT-M, and combined SAT performance.

1.1. Background

At the core of the ethnic debate in SAT scores is that racial/ethnic minority students (i.e., Hispanic students) routinely score lower than non-minority students (i.e., whites or European- Americans) on both the SAT-V and SAT-M (Halpern, Benbow, Geary, Gur, Shibley-Hyde, & Gernsbacher, 2007; Zwick, 2007). Indeed, data depicting SAT performance for the 20-year period from 1987 – 2006 reveals that the mean SAT-V scores for Hispanic and European- American students were 456 and 526 respectively while the mean SAT-M scores were 460 and 523 respectively (Kobrin et al., 2007). The performance data for 2012 indicates similar results as the mean scores for the SAT-V were 448 and 527 for Hispanic and European-American students respectively while the mean scores for the SAT-M were 465 and 536. Furthermore, these ethnic differences in the SAT-M, which are greater than 0.75 standard deviations, have existed for nearly 50 years (Kobrin et al., 2007).

Given these findings and the fact that most people, including ethnic and racial minorities, consider a college or university degree as necessary for obtaining stable and meaningful work (Dwyer & Wyn, 2005; Paulsen, 2001; 2013; Schneider & Stevenson, 1999), clearly knowing which factors/measures influence ethnic differences in SAT performance would be a huge advantage. Unfortunately, despite the existence of achievement gaps between minority and non-minority students, our understanding of gaps in achievement remains poorly understood (Kao & Thompson, 2003; Reardon & Galindo, 2008). Indeed, even though a few studies have attempted to identify factors/measures that explain ethnic differences in SAT scores, most of these studies have failed to explain substantial amounts of variance. Further, these studies have been largely limited to: (i) stereotype threat (Steele &

Aronson, 1995); which is considered to be unreliable (Sackett, Hardison, & Cullen, 2004), (ii) socio-economic family background factors (Hawkins, 1993; Stewart, 1999; Zwick & Sklar, 2005), and (iii) educational opportunities. Moreover, surprisingly to date no study has examined the contributions of social-personality factors (e.g., test anxiety and/or performance-avoidance goals) even though research indicates that these two factors explain a considerable amount of variance in SAT performance (e.g., Hannon, 2012; Hannon & McNaughton-Cassill, 2011).

With respect to socio-economic family background factors (e.g., family income, parental education), numerous studies show relationships between these factors and performance on the combined SAT, SAT-V, and SAT-M (e.g., Mattern, Shaw, & Williams, 2008; Zwick, Brown, & Sklar, 2004). The general finding is that the lower the family income and/or parental education the lower the SAT performance. Presumably, the additional educational resources that higher family income and parental education afford facilitate higher SAT scores. However, the magnitudes of the correlations vary depending on whether they are calculated: (i) using group data, such as the 2007 data for 494,241 US students or are calculated (ii) on a school-by-school basis and then averaged across the schools (Mattern et al., 2008; Zwick & Green, 2007). For instance, Mattern and colleagues (2008) showed that the correlations between SAT scores and family income and parental education ranged from $r=.30$ to $.36$ for the group data but decreased to $r=.16$ to $.24$ when they were calculated on a school-by-school basis (see Zwick & Green, 2007 for a similar finding using a smaller dataset).

When ethnicity is considered, research suggests that the magnitudes of the socio-economic-SAT correlations are equivalent regardless of ethnicity. For example, Mattern and colleagues (2008) showed that the range of socio-economic factors-SAT correlations for European-American students was $r=.12$ to $.20$ while for Hispanics the range of correlations was $r=.14$ to $.16$. However, one criticism of this finding is that the similarity in magnitudes of the correlations suggests that perhaps socio-economic family background factors fail to explain all of the ethnic differences in performance on the SAT (See Hannon 2014 who observed that correlations with similar magnitudes did not explain gender differences in verbal abilities). Indeed, given that: (i) the socio-economic factors of family income and parental education are likely inter-correlated, (ii) the magnitude of the largest correlation is $.20$, and (iii) the magnitudes of the socio-economic factors-SAT correlation are the same for Hispanic and European-American students, it is unlikely that a socio-economic family background factor is the only factor that accounts for *all* the differences in SAT performance that are attributed to ethnicity (see Hawkins, 1993 and Zwick, 2012 for discussions of socio-economic factors and SAT performance). Another criticism is that even if the correlations between socio-economic factors and SAT scores are significant for both Hispanics and Whites/European Americans it is not clear that the variance accounted for by these correlations actually explains ethnic differences in SAT scores. (See Hannon 2012 for an example of this problem when assessing gender differences in reading comprehension). Rather to show that socio-economic factors explain ethnic differences in SAT scores a statistical technique, such as analysis of covariance, needs to be used.¹

Research also suggests that poor academic preparedness is a source of poor academic achievement/SAT performance in minority students (Stewart, 1999). As noted by Byrnes (2003), ethnic differences in achievement exist because European-American students tend to come from more affluent families than minority students (Roscigno, 2000). This greater affluence means that European-American students are more able to pay high tuitions for high-quality schools with excellent reputations. Moreover, availability of learning opportunities, such as calculator use, special high school programs, and coursework explain some of the observed European- American-Hispanic ethnic difference in grade 12 math achievement (Byrnes, 2003). In the context of the present study, this latter finding suggests that exposure to learning opportunities and/or factors related to learning opportunities might explain some of the European-American- Hispanic ethnic difference in SAT performance.

However to date no study has examined whether social-personality factors, such as performance-avoidance (i.e., a focus on a negative outcome such as not performing well on a measure of achievement, Elliot & Church, 1997), and test anxiety (a mental state involving bodily, behavioral, cognitive, and emotional responses, McIllroy, Bunting, & Adamson, 2000) explain ethnic differences in SAT performance. However, research suggests relationships between (i) SAT scores and performance-avoidance goals/test anxiety, as well as (ii) performance-avoidance goals and ethnicity. For instance, Hannon and McNaughton-Cassill (2011) showed that test anxiety and performance-avoidance goals correlated well with scores from the SAT, *range of $r = -.33$ to $.41$* .

With respect to performance-avoidance goals and ethnicity, although no study has directly examined performance-avoidance goals using Hispanics as a target population, Elliot, Chirkov, Kim, and Sheldon (2001) examined whether performance-avoidance goals varied as a function of interdependent-independent self-construals (i.e., how people describe themselves in relation to others). They observed that people who had higher interdependent self-construals (e.g., Asian-American students and people from South Korea and Russia) had significantly greater performance-avoidance goals than do people with independent self-construals (e.g., non- Asian Americans, European-American Americans). Given that Hispanics tend to have high interdependent self construals than European-American students (Markus & Kitayama, 1991), it is possible that Hispanics might also have higher performance-avoidance goals than non-minority students.

In addition, Elliot et al. (2001) showed no relationship between performance-avoidance goals and the socio-economic factors of family income and parental education. In the context of the present study, this finding suggests that performance-avoidance goals and socio-economic factors might each explain unique variance in ethnic differences in SAT performance.

¹This same problem also occurs when research examines ethnic differences in SAT performance by just comparing quantitative differences in means between the ethnic groups; for example when a study compares the family income of Hispanics with the family income of Asians. The reason why is because even if quantifiable differences exist, these quantifiable differences may not explain ethnic differences in SAT scores. Indeed, in the context of gender differences Hannon (2014) showed that even when there were observable significant male advantages for two inferencing tasks, these same two inferencing tasks did not explain gender differences in verbal abilities.

1.2. Summary of Research and Present Study

In summary, studies have sought to explain ethnic differences in SAT scores in terms of differences in stereotype threat and socio-economic family background factors; for example, parental education and family income. However, to date, no study has shown that these factors explain all of the differences for European-American versus Hispanic university students in SAT-V, SAT-M, and combined SAT scores. Moreover, although previous studies indicate that measures of test anxiety and performance-avoidance goals predict scores on the SAT-V, SAT-M, and combined SAT, to date no study has examined whether these measures explain ethnic differences in SAT measures. The present study attempts to address these shortcomings by using analysis of covariance to determine the simultaneous influences that socio-economic family background, social-personality, and learning factors have on ethnic differences in SAT scores. To the best of my knowledge this is the first time a study has simultaneously looked at factors from these three content areas.

Two socio-economic, two social-personality, and one learning measures were administered. The two socio-economic family background measures assessed (i) parental education and (ii) family income. These two factors were selected because studies have demonstrated that they are predictive of SAT scores (Mattern et al., 2008; Zwick & Green, 2007).

The two social-personality measures assessed (i) performance-avoidance goals and (ii) test anxiety. These two measures were selected for two reasons. First, measures of both constructs are predictive of SAT performance (Hannon & McNaughton-Cassill, 2011). Second, because students with interdependent self-construals, such as Hispanics, are likely to have higher performance-avoidance goals (Elliot et al., 2001), measures of performance-avoidance goals might also explain the differences in SAT scores that are attributed to ethnicity.

The final measure assessed epistemic belief of learning (i.e., awareness at a metacognitive level). This measure was selected for two reasons. First, measures of epistemic belief of learning explain variance in SAT scores (Daneman & Hannon, 2001). Second, because Hispanics have fewer learning opportunities (Byrnes, 2003), any learning measure that predicts SAT performance might also predict ethnic differences in SAT scores.

2. Methods

2.1 Participants

The 205 participants were freshmen from a south Texas university. Each student earned \$40.00-\$50.00 for completing one of two large studies: (i) a study examining the powers of cognitive abilities, learning abilities, social beliefs, and attitudes to predict academic and achievement performance in Hispanic versus European-American students and (ii) a study examining the relations between hippocampus/frontal functioning and cognitive/learning abilities. It should be noted that the first dataset has been used in two published papers and both papers are substantially different from the present study; indeed, one paper examined the influences of social-personality/cognitive-learning factors on SAT scores (i.e., Hannon & McNaughton-Cassill, 2011) while the other study examined the influences of social-

personality/cognitive-learning factors on gender differences in SAT scores (i.e., Hannon, 2012).

All students had previously completed the SAT and also indicated that they did not have any known learning disabilities. Additionally, both the Hispanic and European-American students were dominant English speakers. One hundred and forty-three students were European- American and 62 were Hispanic and 102 students were males and 103 females.. The average age of the students was 18.42 years ($std = 0.71$).²

2.2. Measures

The measures are only briefly described below because they are explained in detail in other studies.

2.21. Academic Achievement

All SAT scores were attained from university records. Combined SAT scores were calculated by adding the scores for the SAT-V and SAT-M.

2.22. Social-personality

Students completed the two social-personality measures on a computer by first reading an item from a measure, reporting a choice to a research assistant, and then having the research assistant enter the choice into the computer. In order to make the student feel comfortable with their item choices, the researcher was not able to view the items for the measures on the computer screen.

The first social-personality measure that students completed was a measure of achievement motivation goals developed by Elliott and Church (1997).³ This measure includes three types of achievement motivation, however, only the seven items for the subscale for performance-avoidance goals was used because previous research suggests that this is the only scale that shows significant correlations with SAT scores. A sample item is *I just want to avoid doing poorly in my classes*. Each item in Elliot and Church's measure includes a 7-point Likert scale and lower numbers on the Likert scale represent lower performance-avoidance goals. The Cronbach alpha for this measure is .76 (Elliot & Church, 1997).

The second social-personality measure was a measure of test anxiety developed by Sarson (1978). This measure includes 37 true-false statements such as *As soon as an exam is over I try to stop worrying about it, but I just can't*. "Higher scores on this measure indicate higher test anxiety. The Cronbach alpha for this measure is .90.

2.23. Socio-economic Family Background

The education level of each parent was assessed on a scale from 1 to 9, where 1 represented less than high school and 9 represented post-doctoral education. The composite measure of parental education was calculated by adding together the education levels of both parents.

²Some of these data were used in Hannon and McNaughton-Cassill (2011) and Hannon (2012).

³This measure has been updated by Elliot and Murayama (2008); however, this updated version was not available during data collection.

Family income was assessed on a scale from 1 to 7, where 1 was < \$12,000/year and 9 was \$100,000+/year.

2.24. Learning

The questionnaire for epistemic belief of learning was 12 items from two subsections of Schommer's (1990) epistemology questionnaire. Using a 5-point Likert scale students responded to items such as *I try my best to combine information across chapters or even across classes*. Higher scores signified naive or immature beliefs/knowledge about learning whereas lower scores signified mature beliefs/knowledge. See Daneman and Hannon (2001) for an identical administration. The Cronbach alpha for this measure ranges from .62 to .78.

3. Results

3.1. Descriptive and Correlational Statistics

As depicted in Table 1 all of the measures had wide ranges and normal distributions (i.e., all values for skewness and kurtosis were less than 3). In addition, the ethnicity-SAT-V, ethnicity-SAT-M, and ethnicity-combined SAT correlations were significant, *range of* $r = -.33$ to $r = -.37$, a finding that suggests Hispanic students have lower SAT scores than European- American students (Kobrin et al., 2007). Additionally, all social-personality, socio-family background, and learning measures significantly correlated with ethnicity, *range of* $r = -.33$ to $.23$, a finding that suggests that in comparison to European-American students Hispanics students experience more test anxiety, are more likely to avoid an uncomfortable/less familiar situation, are more naive about learning, and have lower parental education and income. Furthermore performance-avoidance goals, parental education, test anxiety, and belief of learning significantly correlated with all three SAT measures, a finding that suggests these four measures might influence ethnic differences in SAT performance. However, family income failed to correlate with SAT-M scores.

3.2. Statistical methods used to explain the ethnic differences in SAT measures

Five sets of analyses were completed in order to assess whether socio-family background, social-personality, and learning factors explain differences in ethnicity in the three SAT scores. Analysis of Variance (ANOVA) was used in the first set of analyses to ascertain the effect sizes of ethnic differences in SAT-V, SAT-M, and combined SAT scores. In each ANOVA there was one between-subjects variable, namely ethnicity. Analysis of covariance (i.e., ANCOVA) was used in Set two to ascertain both the effect sizes and adjusted means for SAT-V, SAT-M, and combined SAT scores for each of the ethnic groups after the influence of gender was statistically removed. Gender was statistically -removed because its influence on the three SAT measures is routinely present (see Hannon, 2012 and Halpern et al., 2007 for examples) and consequently, differences in gender could confound the present results. Sets three and four also used ANCOVAs. Set three assessed whether socio-economic family background factors might influence ethnic differences in SAT scores after the influence of gender was statistically removed whereas set four assessed whether social-personality/ learning factors might influence ethnic differences, again after the influence of gender was statistically removed. Set three also used t-tests to determine whether the baseline SAT scores (i.e., after gender was removed) of Hispanics were significantly lower than their

respective adjusted scores once the influence of parental education was statistically removed. Finally, set five used ANCOVA to assess whether a combination of socio-economic family background and social-personality/learning factors eliminated more of the ethnic differences in SAT scores than did each factor in isolation. As in sets two, three, and four the influence of gender was statistically removed first. Set five also used t-tests to determine whether the adjusted SAT-V, SAT-M, and combined SAT scores of Hispanics (calculated after the influences of gender, socio-economic family background and social/learning/personality factors were statistically removed) had significantly increased from their respective baseline SAT scores (i.e., calculated after gender was removed).

All effect sizes are reported as partial η^2 . According to Cohen (1988) a partial $\eta^2 = .011$ was considered to be a trivial effect, a partial $\eta^2 = .011$ and $.059$ was a small effect, a partial $\eta^2 = .06$ and $.139$ was a medium effect, and a partial $\eta^2 = .14$ was a large effect.

3.2.1. Ethnic differences in SAT-V, SAT-M, and combined SAT measures

An ANOVA was performed for each SAT measure (e.g., SAT-V, SAT-M, overall SAT) with ethnicity (e.g., male, female) as the between subjects variable. All three ANOVAs were significant. Specifically, as Table 2 shows the scores of European-American students were higher than those of Hispanic students for: (i) the SAT-V (559 versus 496 respectively), $F(1, 203) = 26.44, p = .000, \text{partial } \eta^2 = .115$, (ii) the SAT-M (555 versus 498 respectively), $F(1, 203) = 24.16, p = .000, \text{partial } \eta^2 = .106$, and (iii) the SAT (1114 versus 994 respectively), $F(1, 203) = 32.51, p = .000, \text{partial } \eta^2 = .138$. Thus the present study has replicated the “ethnic gap” in SAT scores.

3.2.2. Ethnic differences in SAT-V, SAT-M, and combined SAT measures after the influence of gender is statistically removed.

An ANCOVAs was completed for each SAT measure with gender as the covariate. As Table 3 shows, the three ANCOVAs revealed that when the influence of gender was statistically removed from the SAT-V, SAT-M, and overall SAT scores, the effect sizes for these three SAT scores increased slightly, $F(1, 202) = 30.21, p = .000, \text{partial } \eta^2 = .131$, $F(1, 202) = 29.00, p = .000, \text{partial } \eta^2 = .126$, and $F(1, 202) = 38.68, p = .000, \text{partial } \eta^2 = .161$ respectively. Indeed, as Table 3 panel (b) shows the adjusted means for the SAT-V, SAT-M, and combined SAT all changed thereby slightly widening the ethnic gaps in SAT scores.

3.2.3. Socio-economic family background explanations of ethnic differences

An ANCOVA was completed for each SAT measure. Besides gender, initially parental education and family income were the covariates in each ANCOVA; however, family income failed to uniquely influence ethnic differences in all three SAT measures and consequently it was removed as a covariate.

As Table 3 shows, statistically removing the influences of gender and parental education from SAT-V, SAT-M, and combined SAT scores attenuated the ethnic differences, $F(1, 201) = p = .000, \text{partial } \eta^2 = .087$, $F(1, 201) = 24.51, p = .000, \text{partial } \eta^2 = .109$, and $F(1, 201) = 28.11, p = .000, \text{partial } \eta^2 = .123$ respectively. These results suggest that the socio-family background factor of parental education eliminates approximately 14% to 34% of the ethnic

gap in SAT scores (i.e., % reduction in effect size for SAT-V scores = (effect size for SAT-V scores after gender removed - effect size for SAT-V scores after gender and parental education were removed)/effect size for SAT-V scores after gender removed)*100).

To determine whether the statistical removal of parental education has a significant influence on Hispanic student's SAT scores, t-tests were completed between Hispanic students' original SAT-V, SAT-M, and combined SAT scores (after the influence of gender was removed) and their respective adjusted SAT-V, SAT-M, and combined SAT scores (after the influence of parental education was statistically removed). The t-tests revealed that the statistical removal of parental education significantly increased the combined SAT scores for Hispanic students (i.e., from 988 to 997), $t(122) = 2.018, p < .01$; however, it failed to significantly increase their SAT-V and SAT-M scores, *both* $t's < 1.0$. Thus, although statistically removing the influence of parental education reduces the effect size of the ethnic gap for SAT-V, SAT-M, and combined SAT scores and significantly increases Hispanics' combined SAT scores, the removal of parental education from SAT-V and SAT-M scores did not significantly increase Hispanics' performance on the SAT-V and SAT-M.

3.2.4. Social-personality/learning explanations of ethnic differences

An ANCOVA was completed for each of the three SAT measures. In each ANCOVA gender was co-varied out; however test anxiety, performance-avoidance goals, and epistemic belief of learning were also co-varied out given they were the covariates of primary interest. The results revealed that when the influences of all of the covariates were removed statistically from SAT-V, SAT-M, and combined SAT scores, the ethnic differences in the three SAT measures were attenuated, $F(1, 199) = 11.38, p = .001, partial \eta^2 = .054$, $F(1, 199) = 13.35, p = .001, partial \eta^2 = .063$, and $F(1, 199) = 16.52, p = .000, partial \eta^2 = .077$ respectively. That is, the measures of test anxiety, performance-avoidance goals, and epistemic belief of learning accounted for approximately 50% of the effect size for ethnicity in scores for the SAT-V, SAT-M, and combined SAT.

To determine whether only a subset of the covariates are necessary to attenuate ethnic differences in SAT performance, multiple ANCOVAs were completed in order to assess all possible combinations of the covariates. As Table 3 shows, the results revealed that after the influences of the two critical covariates, performance-avoidance goals and epistemic belief of learning, were statistically removed the decrease in effect size was nearly equivalent to the decrease in effect size attributed to the three critical covariates (i.e., test anxiety, performance-avoidance goals, and epistemic belief of learning), $F(1, 200) = 13.43, p = .001, partial \eta^2 = .063$, $F(1, 200) = 14.57, p = .001, partial \eta^2 = .068$, and $F(1, 200) = 18.63, p = .000, partial \eta^2 = .085$ respectively.

3.2.5. Socio-economic family background and social-personality/learning explanations of ethnic differences

The final set of ANCOVAs assessed the combined influence that socio-economic family background and social-personality/learning factors had on the ethnic differences in SAT scores. In each ANCOVA gender, parental education, epistemic belief of learning, and performance-avoidance goals were the covariates; although the latter three covariates of

primary interest. As Table 3 indicates the statistical removal of the influences of these measures from SAT-V, SAT-M, and combined SAT scores decreased ethnic differences in SAT scores more than they did with any other combination of covariates, $F(1, 199) = 6.76, p = .01, \text{partial } \eta^2 = .033$, $F(1, 199) = 12.09, p = .001, \text{partial } \eta^2 = .057$, and $F(1, 199) = 12.25, p = .001, \text{partial } \eta^2 = .050$ respectively. In other words, the combination of parental education, performance-avoidance goals, and epistemic belief of learning explained 78.3% of the ethnic gap in SAT-V scores, 55% of the ethnic gap in SAT-M scores, and 69% of the ethnic gap in combined SAT scores.

As a final step, t-tests were completed between the original SAT scores (with the influence of gender removed) and the final adjusted SAT scores for Hispanic students in order to ascertain whether there were significant increases in the Hispanic students' SAT scores. T-tests were not completed on the SAT scores of European-American students because looking at the adjusted means reported in Table 3, panel b it is obvious that there were no appreciable changes in their SAT scores. The results of the t-tests revealed that the SAT-V, SAT-M, and combined SAT scores for the Hispanic students all increased significantly. That is, their adjusted mean of 520 for SAT-V scores was a significant increase from their baseline mean of 493, $t(102) = 11.79, p < .0001$; their adjusted mean of 509 for SAT-M scores was a significant increase from their baseline mean of 495, $t(102) = 6.11, p < .001$; and their adjusted mean of 1030 for combined SAT scores was a significant increase from their baseline mean of 988, $t(102) = 13.38, p < .0001$. Thus it appears that not only do parental education, performance-avoidance goals, and epistemic belief of learning influence the ethnic gap in SAT scores (as shown by analysis of covariance), the statistical removal of the influence of these factors significantly increases all three SAT measures for Hispanic students (as shown by the t-tests).

4. Discussion

This study showed that the socio-economic family background factor of parental education and the social-personality/learning factors of performance-avoidance goals and epistemic belief of learning each explained unique portions of the ethnic differences in SAT performance. In addition, when the influences of these three factors were statistically removed simultaneously, the ethnic differences in SAT performance decreased even more. Indeed the decreases in ethnic differences in the three SAT scores ranged from 55% to 75% and these decreases in ethnic differences reflected in increases in Hispanics' SAT-V, SAT-M, and combined SAT scores. However, family income failed to have a unique influence on ethnic differences in the three SAT scores

The present findings replicate previous research that suggests parental education is a predictor of SAT-V, SAT-M, and combined SAT performance (e.g., Mattern et al., 2008; Zwick & Green, 2007). However, the present study also extends well beyond this research by showing that the socio-economic family background factor of parental education does not explain all of the ethnic difference in SAT performance. Indeed although parental education explains approximately 14% to 34% of the reduction in ethnic difference in SAT performance, the t-tests between the beginning and adjusted SAT scores indicated that

parental education only significantly increased Hispanic's combined SAT scores; the SAT-V and SAT-M scores of Hispanics did not significantly increase.

Additionally, the present study showed that other factors, besides parental education explain substantial amounts of variance in SAT performance. Specifically, the results showed that performance avoidance goals and epistemic belief of learning also reduced the effect size of the ethnic gap in SAT-V, SAT-M, and combined SAT scores by approximately 45%.

The present findings extend the research of Elliot et al. (2001) who observed a positive relationship between performance-avoidance goals and interdependent self-construals. However, whereas Elliot and colleagues' participants with high interdependent self-construals were of Asian or Russian descent, in the present study the participants with high interdependence were of Hispanic descent. The present study is also the first study to show not only do Hispanics have higher performance-avoidance goals than do European-American students, but also to show that performance-avoidance goals explain some of the ethnic difference in SAT-V, SAT-M, and combined SAT scores.

Finally, the present findings extend Hannon and McNaughton-Cassill's (2011) study, which showed that, when combined, measures of cognitive/learning and social-personality factors accounted for as much as 44.6% of the variance in SAT performance. Indeed, their analysis showed that the ranges of correlations (i) between a measure of epistemic belief of learning and the three SAT measures and (ii) between a measure of performance-avoidance goals and the three SAT measures were $r = -.28$ to $-.42$ and $r = -.34$ to $-.39$ respectively. Consistent with their findings, the present study also observed that epistemic belief of learning and performance-avoidance goals influenced SAT-V, SAT-M, and combined SAT scores. But more importantly, the present study showed that epistemic belief of learning and performance-avoidance goals accounted for nearly half of the ethnic gap in SAT performance.

Theoretically speaking, the best explanation for the ethnic gap in SAT performance is a multi-component one that includes the separate and unique influences of level of parental education, epistemic belief of learning, and performance-avoidance goals. With respect to level of parental education, maybe parents with higher education are better role models for their children than are parents with lower education. Or, perhaps parents with higher education encourage their children to continue with their education more so than do parents with lower education. Additionally, it is possible that students who have more mature beliefs about learning are better at extracting and manipulating information in the SAT, whereas students with naive beliefs tend not to engage these types of processes. Consequently, the latter group of students are less successful on the SAT. Finally, with respect to performance-avoidance goals it is feasible that students with lower performance-avoidance goals are less likely to avoid studying for important academic achievement tests, such as the SAT and GRE, and consequently, are more likely to perform well. Conversely, students with higher-performance-avoidance goals avoid studying for important achievement tests and thus perform more poorly.

The present study also has limitations. One important limitation is that the three SAT measures were assessed before any of the predictors were measured and for this reason the present study cannot determine causality. As well, only a single population of students at one university was included and consequently, it is important that future research assess whether the present findings generalize to other populations. A third limitation is that although parental income emerged as redundant with parental education, the present study did potentially forfeit some measurement precision in parental income because discrete points were taken to represent the underlying continuum. Moreover, although the present study restricted its sample to dominant English speakers in order to avoid explanations based on competency differences in use of English language the present study included only a modest number of Hispanics. Future research should seek to include a greater number of Hispanic students. Finally, the present study has addressed ethnic differences in SAT performance by making comparisons between Hispanic and European-American students. Future research should explore ethnic differences by including other ethnic minorities, such as African-American or Asian students.

In summary, this study showed that parental education, performance-avoidance goals, and epistemic belief of learning attenuated 59% to 78% of the ethnic differences in SAT-V, SAT-M, and combined SAT scores. In contrast, although family income correlated with SAT performance, it failed to explain ethnic differences in SAT performance. This is the one of the first times research has used analysis of covariance to examine ethnic differences in SAT scores. This is also the first time that research has examined simultaneously the influences that these three factors have on the ethnic gaps in SAT-V, SAT-M and combined SAT scores. Finally, given that the present study has shown that some new and novel factors influence ethnic differences in SAT measures future research might wish to explore whether still other factors explain ethnic differences in SAT performance.

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Table 1. Descriptive Statistics and Correlations among Ethnicity, Measures of Academic Achievement (i.e., SAT-V, SAT-M, and Overall SAT), Social/Personality Factors, Socio-Economic Family Background Factors, and the Learning Factor ($n=205$).

	1	2	3	4	5	6	7	8	9
1. Ethnicity ^d	---	-.34*	-.33*	-.37*	.23*	.27*	-.33*	-.29*	.23*
2. SAT-V		---	.61*	.90*	-.40*	-.32*	.29*	.11	.38*
3. SAT-M			---	.89*	-.31*	-.34*	.15*	.17*	-.23*
4. Overall SAT				---	-.40*	-.37*	.25*	.16*	-.34*
5. Test anxiety					---	.54*	-.07	.04	.23*
6. Performance avoidance						---	-.09	-.05	.19*
7. Parental education							---	.36*	-.09
8. Family income								---	-.08
9. Epistemic belief of learning									---
Mean		539.66	538.10	1077.76	15.38	4.65	11.88	4.34	34.23
Standard deviation		85.89	80.69	149.32	7.38	1.03	4.68	1.81	4.93
Skewness		0.42	0.15	0.20	0.36	-0.43	-0.53	-0.48	-0.07
Kurtosis		-0.30	0.31	-0.16	-0.75	0.27	-0.94	-0.78	-0.55
Lowest score		350.00	400.00	690.00	2.00	1.83	2.00	0.00	23.00
Highest score		800.00	800.00	1540.00	33.00	7.00	18.00	7.00	45.00
Maximum score		800.00	800.00	1600.00	37.00	7.00	18.00	7.00	60.00

* *Note.* $p < .05$.

^dFor ethnicity, European-Americans = 1 and Hispanics = 2; for example the -.34 between ethnicity and SAT-V means that European-American students have higher SAT-V scores than do Hispanics.

Table 2.

Descriptive Statistics, for Measures of Academic Achievement, Social/Personality Factors, Socio-Economic Family Background Factors, and the Learning Factor as a function of Ethnicity.

	European-Americans (<i>n</i> = 143)	Hispanics (<i>n</i> = 62)
<i>SAT</i>		
SAT-V	558.81 (84.57)	495.48 (71.99)
SAT-M	555.39 (77.96)	498.23 (72.89)
Overall SAT	1114.20 (143.23)	993.71 (128.50)
<i>Social/Personality Factors</i>		
Test anxiety	14.27 (7.25)	17.95 (7.10)
Performance-avoidance goals	4.46 (1.01)	5.08 (0.94)
<i>Socio-Economic Family Background Factors</i>		
Parental education	12.88 (4.12)	9.58 (5.09)
Family income	4.69 (1.60)	3.53 (2.01)
<i>Learning Factor</i>		
Epistemic belief of learning	33.49 (4.91)	35.94 (4.60)

Note. Standard deviations are in brackets.

Table 3
 Effect sizes and Means for Ethnic Differences in SAT-V, SAT-M, and Overall SAT scores as a Function of the Covariates.

Covariate(s)	Effect Sizes after the Removal of the Covariate(s)		
	SAT-V	SAT-M	Overall SAT
No covariate(s)	.115 ^{***}	.106 ^{**}	.138 ^{**}
Gender	.131 ^{**}	.126 ^{**}	.161 [*]
Gender, parental education	.087 ^{**}	.109 ^{***}	.123 ^{**}
Gender, test anxiety, performance-avoidance, and epistemic belief of learning	.054 ^{***}	.063 ^{**}	.077 ^{**}
Gender, performance-avoidance and epistemic belief of learning	.063 ^{**}	.068 ^{**}	.085 ^{**}
Gender, performance-avoidance, epistemic belief of learning, and parental education	.033 ^{***}	.057 ^{***}	.050 ^{***}
(ii) Means, Adjusted Means, and Standard Deviations by Ethnic Group as a Function of Removal of Covariates			
	<u>European Americans</u>		
	SAT-V	SAT-M	Overall SAT
No covariates removed	559(84.57)	556(77.96)	1114(143.23)
Gender removed	560(79.76)	557(74.74)	1117(135.37)
Gender, parental education removed	557(79.89)	556(76.31)	1113(137.18)
Gender, performance-avoidance, epistemic belief of learning, and parental education removed	548(74.50)	551(75.81)	1099(130.10)
	<u>Hispanics</u>		
	SAT-V	SAT-M	Overall SAT
No covariates removed	496(71.99)	498(72.89)	994(128.50)
Gender removed	493(79.92)	495(75.35)	988(135.67)
Gender, parental education removed	501(81.93)	496(78.15)	997(140.56)
Gender, performance-avoidance, epistemic belief of learning, and parental education removed	520(78.50)	509(79.92)	1030(137.14)

Note. Effect sizes are partial η^2 .

* indicates large effect,

** indicates medium effect

*** indicates small effect.