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THE VALIDITY OF THE SAT AND ACT

A MASTER'S THESIS

SUBMITTED TO THE FACULTY

OF BETHEL UNIVERSITY

BY

HANNA M. STURM

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THE VALIDITY OF THE SAT AND ACT

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APPROVED

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Abstract

For millions of high schoolers across the United States, an important precursor for attending a four-year college or university is completing the SAT or ACT. This test score is used in admission decisions to determine how prepared that student is for post-secondary education. This literature review examines the major issues regarding the validity of the SAT and ACT. Research has shown these tests do not solely measure college readiness. There are demographic factors, like race and family income, that have significant effects on scores. Also, test preparation, like tutoring, can increase scores significantly. Additionally, these tests have a high correlation with intelligence tests, and studies have proven that high school factors predict college success better than test scores.

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CHAPTER I: INTRODUCTION

Standardized Admissions Testing

The goal of high school is to graduate students who are college or career-ready. For the millions of students planning to attend a four-year college or university, a critical step in getting there is taking and performing well on the SAT or ACT. According to the SAT and ACT, the purpose of these tests is to determine the student's level of preparedness for college (ACT, 2019; SAT, 2022). This is one of the most important tests they will ever take because their score will either open or close doors. For example, some colleges and universities will automatically offer admissions to students with a certain SAT or ACT score. These scores become even more important for students who want to attend the nation's most selective colleges and universities. The SAT and ACT hold so much power that parents will pay for private tutoring, practice exams, and other preparation materials. High schools offer tutoring sessions and opportunities for SAT and ACT pretests. There can be so much pressure placed on students to get a good score, but is it all necessary?

A harsh light was cast on these standardized tests during the college admissions scandal in March 2020. Parents, and those they paid, were accused and found guilty of cheating and reporting false SAT scores in order to ensure their children were accepted into the selective colleges and universities they applied for (Gibson & McCarthy, 2019). Questions were raised by many about how these institutions admit students and the legitimate use of standardized test scores in admission decisions. Educational researchers have long questioned the validity of these tests. In research, validity reflects how well a measure assesses what it was intended to assess. In standardized admissions testing, we would ask if the SAT and ACT assess college readiness and

to what degree. Throughout this literature review, I will discuss and share the research regarding the major issues with using standardized tests in college admissions decisions.

The SAT and ACT

The first standardized tests were administered over 2,000 years ago in China (TED-Ed, 2017). These tests are now widely used today, starting in early elementary school through high school. Standardized tests also include college admissions tests, like the SAT and ACT. Both of these tests are used in college admission decisions across the United States as a way to determine which students are academically prepared for post-secondary education. Both tests are about 3 hours and have an optional essay writing portion. According to the ACT (2020), both the SAT and ACT offer free score reports and are accepted at all four-year institutions in the US. Although there are many similarities, the tests are distinct.

According to ACT (2021), the test is divided into 4 subtests: English, reading, math, and science. A composite between 1-36 is reported by taking the average of the four subtest scores. For the SAT, there are three subtests: math, writing and written language, and reading. According to PowerScore (n.d.), one major difference is that the ACT allows the use of a calculator during the math subtest where the SAT does not allow it during one of the math sections. According to CollegeBoard (2018), students receive a composite between 400-1600 that is calculated by combining the subtest scores of math and evidenced-based reading and writing, which include the scores of the reading and writing and written language subtests. From 2012 on, the ACT was the more popular of the two tests. However, in 2018, more students took the SAT. Close to 2 million students from the graduating class of 2018 took the SAT, while about 1.9 million students opted for the ACT (Anderson, 2018). The versions of these tests that millions of students are taking today are quite different from their originals.

History of the SAT and ACT

The origins of the SAT began close to 100 years ago. According to Public Broadcasting Services (n.d.), Robert Yerkes, a Harvard professor, and Carl C. Brigham, a Princeton professor, began administering IQ tests to army recruits. Brigham, administering his own test to students, was asked by the College Board to develop a test for high school students. In 1926 the SAT was administered for the first time. By 1935, Harvard University required all applicants to take the SAT, and by 1957 there were over a half million students taking the test every year. Just a few years later, the University of California system required all of its applicants to take the SAT (PBS, n.d.). Since its inception, the SAT has gone through several changes. According to PowerScore (n.d.), the first meaningful changes occurred in 2005 when a required essay and writing score was added. Another big change happened in 2016. Several adjustments to the SAT were made, so it was more like the ACT as well as aligning better with the Common Core. Some of these changes included no penalty for guessing, making the essay optional, and reducing the number of answer options from five to four (PowerScore, n.d.).

In 1959, the American College Testing organization was formed and became the SAT's competitor. Although very different from the SAT, the ACT was also initially developed from previous assessments. According to the ACT (n.d.), the creators of the ACT, including Everett Franklin Lindquist, wanted an assessment that more closely resembled high school instructional outcomes. Lindquist wanted this test to measure achievement, not intelligence (ACT, n.d.). The first version of the ACT was developed from the Iowa Tests of Educational Development, which was a high school achievement assessment (Koretz et al., 2016). By 1968, more than 1,400 colleges and universities were accepting ACT scores (ACT, n.d.). Like the SAT, the ACT has also been revised. According to the Manhattan Review (n.d.), the most significant changes to the

ACT occurred throughout the 1980s. A science reasoning and reading section were added to the test. These two subtests replaced the original sections of natural sciences and social studies.

Another change came in 2005 when an optional writing subtest was added in direct response to the SAT's essay section (Manhattan Review, n.d.).

Criticisms of the SAT and ACT

In 2001, Richard C. Atkinson, the president of the University of California, suggested the SAT not be used in admission decisions. He recommended using assessments that more closely resembled what students were learning in high school. Since UC was the first and one of the largest users of the SAT, this proposition by the president was the catalyst for the SAT changes in the years that followed (PBS, n.d.; Zwick, 2007). This was a major step in providing increased equity in post-secondary education. In education, equity means every student is receiving exactly what they need so they can reach their full potential. According to the National Equity Project, in order to provide an equitable education, social and cultural factors must not affect student achievement (National Equity Project, n.d.).

Beyond Atkinson, researchers and educators have argued these standardized admission tests do not predict college readiness because the skills needed to graduate high school are similar to those needed to graduate college. This is a major reason why some believe a high school GPA is better at predicting college readiness. Another criticism is that the tests are biased. According to the Edvocate, a testing bias occurs when a test disadvantages specific groups of students either in how it is written, administered, or scored (Lynch, 2021). There are significant racial and income gaps seen in SAT and ACT scores. Minority students, especially those who identify as African American/Black, American Indian, or Hispanic, and students from low socioeconomic backgrounds perform more poorly than their peers on both the SAT and ACT.

These gaps have serious implications because some colleges guarantee admission based on test scores. For example, Mankato State University offers guaranteed admission to any student who receives a 21 on the ACT, as long as they have a satisfactory GPA. The average white student would automatically be accepted, with a score of 22, while the average Black student, with a score of 17, would not (Minnesota State University Mankato, n.d.). Some researchers have even called them “wealth tests” because of their strong connection with family socioeconomic factors (Zwick, 2002, p. 307). This is another reason against using test scores in admission decisions.

The University of California announced, in 2020, that they would be moving to a test optional admissions process for the 2021-2022 and 2022-2023 school years. After that, the University will no longer consider any SAT or ACT score for all California high schoolers submitting an application (University of California, 2020). The criticisms and inadequacies of both the SAT and ACT have led to more and more institutions becoming test optional over the past several years. The very selective University of Chicago, which became test-optional in 2018, asks students to submit any application materials they feel best represent them as a student and also allows the student to choose the test-optional choice if they “... feel that an SAT or ACT score does not fully reflect their academic preparedness or potential” (University of Chicago, n.d.). According to FairTest.org, in 2019, 1,050 colleges and universities had dropped their test score requirements (FairTest, 2019).

Guiding Questions

Schools, students, and families will go to great lengths to ensure a competitive score is received. For exams with such important consequences, every effort should be made to make sure the tests themselves, as well as the results are valid, fair, and without bias. There have been

considerable research studies conducted in the past with the purpose of determining whether or not these tests measure what they are intended to measure: college readiness. This literature review will examine the criticisms of these tests summarized in the previous section. It will also answer questions such as: Is the ACT or SAT biased in any way? Are these tests necessary or fair factors for determining admittance? Do they predict college performance? Which students use test preparation materials or coaching and does it affect test scores?

CHAPTER II: LITERATURE REVIEW

Research Process

Chapter two will present and critique literature related to the guiding questions: Is the ACT or SAT biased in any way? Are these tests necessary or fair factors for determining admittance? Do they predict college performance? Which students use test preparation materials or coaching, and does it affect test scores? Searches in Google Scholar and Bethel's library databases were used to find literature related to standardized admission tests including the ACT, SAT, and SAT-II. The databases included EBSCOHost, ERIC, JSTOR, Project Muse, and SAGE. Peer reviewed publications ranging from 2000 to 2022 were prioritized. The most recent literature was given the highest priority as these tests are often revised and updated. The keywords used in my searches included "coaching effects on test scores," "predicting success in college," "test optional practices," "predictive power of the SAT and ACT," and "validity of SAT and ACT."

Test Preparation

The importance of these tests is such that there is now a billion-dollar industry for both ACT and SAT preparation (Moss et al., 2012; Buchmann et al., 2010). Some students and parents turn to private tutoring agencies to improve their scores. A popular choice is Huntington Learning Center which offers one on one tutoring for both the ACT and SAT tests. Their website reports average gains of 229 points on the SAT and 5.4 points on the ACT (Huntington Learning Center, n.d.). Other forms of test preparation include the use of materials like manuals, books, videos, and software but also private classes. All of these options have a cost. Buchmann et al. (2010) reports The Princeton Review, one of the most popular test prep companies, made \$110.4 million in 2009. Does coaching increase scores? Who uses test preparation?

College admissions test prep is part of a larger, broader educational trend defined as “shadow education” by Buchmann et al. (2010, p. 3) in their research related to test preparation. Shadow education includes any educational activity that is offered beyond the student’s classroom. It could include activities like private tutoring or enrichment classes. Shadow education also includes SAT preparation. Buchmann et al. (2010) attempted to answer two important questions related to this type of shadow education: what types of students and families use what type of preparation? Can SAT preparation increase scores? Using student data from 1994 and 2000, a little over 8,000 students were analyzed for this study. Students were asked if they used test preparation strategies and which kinds. The options provided by Buchmann et al. (2010) were: to participate in a preparation course at their high school, participate in a course from a preparation service, participate in private one-on-one tutoring, use books to study from, use a computer program, use a test preparation videotape, or use a combination of several choices. Participating in no test preparation was also an option.

After analyzing the results, the most common type of preparation, at 40%, was a book, video, or software program. This is much higher than the 27% of students who responded they used no test preparation. The percentages for the other preparation options were slightly lower with 15% of students participating in a high school course, 11% participating in a private course, and 7% participating in one-on-one tutoring sessions (Buchmann et al., 2010).

The second type of result analyzed by Buchmann et al. (2010) was those who participated in test preparation and their demographics. Several results emerged. First, female students were more likely than male students to participate in all of the options presented. Second, students from the Northeast are more likely to prepare than students living in the West or Midwest. Last, the education level of a student’s parents did not have a large effect on using the preparation

options at the highest level, like private tutoring (Buchmann et al., 2010). However, family income did affect student preparation. Students with a higher family income and education level were not as likely to have used no preparation or the affordable options, like a test preparation book (Buchmann et al., 2010). Students with high family incomes were more likely to participate in expensive forms of preparation, private courses, or private tutoring. For reference, in 2007, the cost of SAT preparation courses from The Princeton Reviews ranged from \$1,000 to \$1,200, and private tutoring could cost between \$1,500 to \$6,900 (Buchmann et al., 2010). Buchmann et al. (2010) were most curious about the differences between minority and white students. The research indicated minorities prepare for the SAT using test preparation more than white students. More specifically, Black students were more likely than white students to participate in three out of the four preparation options, even when their families have similar backgrounds in terms of education and income (Buchmann et al., 2010).

The third type of results analyzed was the degree to which preparation affected SAT scores. Many tutoring centers and test preparation companies advertise how many points they can guarantee a student's score can increase, but is it true? Buchmann et al. (2010) found that preparation did increase SAT scores. The students who participated in a high school course increased their score by 26 points when compared to students who did not use any form of preparation. This number increases when comparing the scores of students who used a private class, an increase of 30 points, or used a private tutor, which resulted in a 37-point increase (Buchmann et al., 2010). To put this in perspective, the highest SAT score is 1600, while the lowest is 400. An increase of 30-40 points could be significant when college admission offices are deciding between applicants. Buchmann et al. (2010) summarized that students from more advantaged backgrounds are more likely to use the test preparation options that increase SAT

scores. Buchmann et al. (2010) reported an important limitation in their data. They were not able to differentiate between students who took the SAT one time versus several times. Also, although this study was published in 2010, the dataset used was from the 1990s mainly. Buchmann et al. (2010) explain that test preparation options have grown since then, so the estimates revealed may be “conservative” (p. 441).

A few years later, Park and Becks (2015) examined the effects of test preparation and how the student’s high school and background relate to test preparation. Their sample size from 2002 was slightly larger, about 8,500 students, than the sample in Buchmann et al. (2010). However, they used a similar ranking of test preparation options ranging from no test preparation to the highest level, private tutor.

The results revealed many similarities, as Buchmann et al. found in their 2010 study. First, female students used all forms of test preparation more than male students. Also, Black students were more likely than their white peers to use test preparation. Third, having a higher family income did correlate to students using private courses or tutoring.

A major difference between the two studies was the impact of test preparation on student SAT scores. Park and Becks (2015) revealed a much lower impact of test preparation. When compared to students not using any form of test preparation, students who used a private course increased their score by 11 points. This is over 20 points less than the 37-point increase reported by Buchmann et al. (2010). Another difference between Park and Becks (2015) and Buchmann et al. (2010) was that Asian American students were more likely than their white peers to use the highest levels of test preparation, like a private course or tutor. The last difference was the educational background of the parents. Only Park and Becks (2015) reported parental education to be a factor. They found that if a parent had a college degree, the student was more likely to

take a high school or private test preparation course. Additionally, students taking a private course or receiving private tutoring were also associated with parents who had a graduate degree. Further, students who talked to their families about college and the SAT were more likely to use any form of test preparation. Likewise, students who sought out information about colleges from their school's counselor or one of their teachers were more likely to use test preparation (Park & Becks, 2015).

Park and Becks (2015) were also curious if high school environments had an effect on SAT preparation. When compared to the students who attended Catholic schools, students enrolled in public schools were less likely to engage in three of the four options of test preparation. Similar to the findings in Buchmann et al. (2010), students living in the Northeast were more likely to engage in test preparation than in any other region. Another factor influencing test preparation was the size of the school and the extent to which it offers AP classes. Parks and Beck (2015) reported that students who attended larger schools and schools with more AP classes were significantly more likely to participate in test preparation options that included private courses and tutoring. Parks and Beck (2015) reported two main limitations. First, they could not distinguish certain differences within preparation options. This includes the cost of the class or tutor and the number of hours students spent in their class or with their tutor. Last, Parks and Beck (2015) used the same hierarchy of preparation strategies, like private tutoring as being the highest, as in other studies, like Buchmann et al. (2010), but admitted there could be exceptions made.

Although quite different in their format, just like the SAT, the ACT is used for college admissions purposes. Like the research presented in the previous studies, there is also research related to ACT preparation. In a smaller study at a Midwestern high school, Moss et al. (2012)

investigated the effects coaching and test preparation had on the ACT scores of 60 juniors. The students participated voluntarily in the study, and according to school leadership seemed to be a good representation of the school as a whole (Moss et al., 2012). Students were first split into two groups based on their prior scores. There was a high group, which included students with a score of at least 21, and a low group, which included students with a previous score of less than 21. A score of 21 was chosen because that is the average ACT score. The instruction was differentiated between these two groups. However, every student received 20 hours of instruction over four weeks. Students received 10 hours for the reading and English subtests and 10 hours for the math and science subtests. Each coaching session lasted for two and a half hours. According to Moss et al. (2012), the preparation course was taught by veteran teachers trained as ACT coaches. Every participant was given ACT practice tests, instructional handouts, and a workbook. There were specific, laid out plans for each coaching session. Sessions included a review of the test's content, strategies for test taking, and taking older versions of the ACT tests for practice. Students were assigned homework, but it was not checked by the coaches (Moss et al., 2012).

Like the results cited by Buchmann et al. (2010) and Park & Becks (2015), test preparation did increase student ACT scores (Moss et al., 2012). The composite score for students, which is the average of the four subtest scores, increased by 1.5 points. The uncoached group had an average composite score increase of 0.65 points. The increases within the four subtests were varied. For reference, the composite and subtest scores can range from 1-36. The greatest subtest improvement was in English. Moss et al. (2012) saw an increase of 2.35 points for the coached group of students. The uncoached group increased their scores by 0.45 points. The English scores saw the biggest difference in scores between the two groups. Reading saw the

second greatest improvement with an average increase of 1.77 points. The uncoached group saw an increase of 1.02 points. The math and science subtests saw less than a 1 point improvement. The average increases were 0.92 and 0.96, respectively. The uncoached group increased their scores by 0.40 and 0.71, respectively (Moss et al., 2012). A limitation noted by Moss et al. (2012) was the assumption students in the uncoached group did not participate in preparation on their own. The students who received the test preparation increased their scores in all subtests more than the uncoached group, although the gains were minimal in science. Moss et al. (2012) conclude that these gains are significant because students only participated in a short-term course.

A large study by Briggs (2001) sought to answer the question, “Does test preparation help improve student performance on the SAT and ACT?” with their research on over 14,000 students (p. 17). Briggs’ methodology was different from the studies mentioned previously. Briggs (2001) used P-SAT (practice SAT), SAT, and ACT scores as well as survey information related to test preparation. P-SAT scores were used as “proxies” to compare student improvement on the ACT or SAT after test preparation occurred (p. 13). Briggs (2002) justified this process as P-SAT scores strongly correlate (0.9) with SAT scores because the structure of the two tests is nearly identical. The correlation between P-SAT and ACT is not as strong, ranging from 0.8 to 0.82, depending on the ACT subtest. The test preparation options were just like the ones identified in Buchmann et al. (2021) and Park and Becks (2015), using books, videos, and computer software, participating in a high school course, participating in a private course, and participating in private tutoring.

Briggs (2001) found that, overall, coached students were wealthier, more motivated, and more prepared to take these tests than compared to uncoached students. Specifically, the

“...coached students were more likely to be Asian and in the top socioeconomic quartile...” when compared to the uncoached students (Briggs, 2001, p. 14). The findings related to family income were similar to Buchmann et al. (2021) and Park & Becks (2015). Briggs (2001) also reported the coached students were concerned about the status or standing of the colleges and universities they wanted to attend and had parental encouragement for test preparation.

Lastly, Briggs (2001) revealed increased test scores on both the SAT and ACT. As we have seen with the previous studies, the highest increases come from private tutoring or courses. In the math section, students who received coaching from a private tutor improved their scores by 19 points more than those with a private tutor (Briggs, 2001). The verbal section saw less of an effect, with an average increase of seven points. Students who participated in a private course improved their math scores by 17 points. The effect in the verbal section was greater than with a private tutor at an increase of 13 points (Briggs, 2001). When combining math and verbal scores, students who used a private tutor increased their scores by 26 points, and those who used private courses increased theirs by 30 points. The 30-point increase is identical to the increase Buchmann et al. (2012) found in their research. The effect of this preparation was much different for ACT scores when compared to the results Moss et al. (2012) revealed in their study. Briggs (2001) found an increase of 0.0 to 0.4 points in the math section and 0.3 to 0.6 in the English section. Most surprisingly, there was a negative effect on the reading subtest of 0.6 to 0.7 points (Briggs, 2001).

In a commentary titled, “Using National Education Longitudinal Study (NELS) Data to Evaluate the Effects of Commercial Test Preparation,” immediately following the Briggs (2001) study in the *Chance Journal*, Daniel Powers describes both strengths and limitations of Briggs’ study. The main strength was the use of a large sample size, 14,000 students, that was nationally

representative. The limitations of the study were similar to the ones listed in the previous studies. There were no identified costs or time required for students taking private classes (Briggs, 2001, p. 20).

Though these two admissions tests are different, many similarities were found related to test preparation. The studies presented above found preparation, depending on the type, to be an effective way to increase scores. However, the degree to which scores could increase varied among the studies. When assessing socioeconomic factors, like school and family characteristics, Briggs (2001), Buchmann et al. (2021), and Park and Becks (2015) all reported positive correlations.

These discoveries highlight which high school a student attends and the opportunities they offer matter. Family demographics matter, and more specifically family income. Park and Becks (2015) summarize this relationship by explaining that students who have all the “cultural capital” from their schools and home participate in test preparation and achieve higher scores (p. 20).

Relationship with Intelligence

A common and long-held belief is the SAT measures intelligence more than it measures academic abilities or what students have learned in school. Researchers have studied this claim for many years. One of the most popular, widely cited studies was completed by Frey and Determan in 2004. The purpose of their research was to examine the relationship, if there was one, between SAT scores and cognitive functioning. They used two sample groups. The first study included a little over 900 students with ages between 14 and 21 (Frey & Determan, 2004). These students took both the SAT and ASVAB (Armed Services Vocational Aptitude Battery). Frey and Determan (2004) derived IQ scores from the ASVAB scores but some participants had

IQ scores from other assessments. The results showed a significant correlation between SAT and ASVAB scores (0.82) and correlation between SAT and IQ, from other assessments ranged from 0.53 to 0.82 (Frey & Determan, 2004).

The second sample used by Frey and Determan (2004), which was much smaller, included 104 students that were attending a private school. These students had SAT scores on file but were also assessed using a nonverbal reasoning skills test called Raven's Advanced Progressive Matrices (APM). These scores were converted into IQ scores in the same way as the previous study (Frey & Determan, 2004). Results revealed a correlation between SAT and the APM scores. The correlation was slightly less than in study 1 at 0.483. Frey and Determan (2004) called the correlation between SAT and intelligence "striking" (pg. 376). They theorized the SAT is an acceptable test of intelligence.

A few years later, a team of researchers studied Frey and Determan's 2004 study. They wanted to assess the validity of their work, including the regression equations used (Beaujean et al., 2006). Their methodology was quite similar, using slightly less than 100 students at a private college. Their ages ranged from 18 to 24 and were mostly female students and Caucasian. Students were assessed using the Reynolds Intellectual Assessment Scales and the scores were compared with their SAT scores (Beaujean et al., 2006). The same equations as used by Frey and Determan were used and Beaujean et al. (2006) confirmed that one of the equations better predicted IQ than the other. However, they summarize that their research supports the results of Frey and Determan (2004) and that "... SAT is an adequate measure of general intelligence..." (Beaujean et al., 2006, p. 357).

Researchers Coyle and Pillow (2008) attempted to confirm the findings in Frey and Determan (2004) that the SAT measures intelligence. Like Frey and Determan (2004), Coyle and

Pillow (2008), used two different studies. The first study included a little over 150 students from the University of Texas at San Antonio. The median age was 19, and the majority of participants were female, and about half were white (Coyle & Pillow, 2008). All students took the SAT and some also took the ACT. These scores, along with GPA, were provided by the University. Coyle and Pillow (2008), gave each student a cognitive assessment so correlations between the ACT and SAT could be identified. Results indicated that SAT and ACT scores were correlated with the cognitive assessments given to students. However, some of the correlations were stronger than others. The Wonderlic, a commonly used IQ test, had a mean correlation of 0.71 with the ACT and SAT which was the highest. For comparison, the lowest correlation was 0.11 (Coyle & Pillow, 2008).

The second study by Coyle and Pillow (2008) was much larger. Using data from 1997, over 7,000 students provided a ASVAB score and over 2,500 had an SAT or ACT score. Slightly over half of the students were white. The ASVAB was the same cognitive assessment used in Frey & Determan (2004). The findings in this study confirm the findings in the first study: the SAT and ACT are related to intelligence. Coyle and Pillow (2008) reported the correlation between SAT and the ASVAB ranged from 0.28 to 0.69. The median was 0.50. For the ACT, the correlation range was very similar, 0.29 to 0.67. The highest correlation here was only slightly less than in the first study. It should be noted that the mean correlation of the academic subtests was 0.64 (Coyle & Pillow, 2008). Like Beaujean et al. (2006), the results revealed in these two studies confirm, to some degree, the results of Frey and Determan (2004). After analyzing their results, Coyle and Pillow (2008) theorized that the ACT or SAT could be called an intelligence test.

In their attempts to describe the relationship between intelligence and test scores, Koenig et al. (2008) used IQ and ACT scores in two separate studies. In the first study, Koenig et al. (2008) used the same data set from 1979 as Frey and Determan (2004). These participants, aged 14-27, were interviewed every year from 1979 to 1994. The data collected was from interviews conducted in 1980, 1981, and 1983. It was a diverse sample of 41% Caucasian, 24% African-American, and 15% Hispanic participants. Koenig et al. (2008) used the ACT scores, ASVAB scores, and scores from other intelligence tests to measure correlations. In the second study, which was much smaller, Koenig et al. (2008) used the ACT scores along with IQ scores from the Raven's Advanced Progressive Matrices (APM). The participants attended a private university and included about 70 male and female students, for a total of 149 (Koenig et al., 2008).

The results among these two studies were quite similar to each other and to the results reported by Coyle and Pillow (2008). Koenig et al. (2008) found a significant relationship between ACT scores and intelligence tests. They suggested the ACT is an “acceptable measure” of intelligence (Koenig et al., 2008, p. 158). In the first study, the correlation between ACT scores and IQ from the ASVAB was 0.77. When looking at all of the intelligence tests used, of which there were six others, the correlations with ACT scores ranged from 0.55 to 0.81. Based on these results, Koenig et al. (2008) determined the ACT is nearly identical to an intelligence test. The results in the second study revealed a correlation of 0.75 between ACT scores and Raven's APM scores. If looking at individual subtests, the correlation between ACT math and the intelligence test was 0.65. The correlation between ACT English and Raven's APM was 0.57 (Koenig et al., 2008). Based on these scores, Koenig et al. (2008) found high correlations between the intelligence measures and ACT scores. The researchers concluded by

recommending the ACT organization describe their test as an intelligence test and not just a college readiness test (Koenig et al., 2008).

Although not advertised as an intelligence test, only achievement, academic, or aptitude tests, the results of the studies discussed above show these tests do positively correlate with intelligence measures (Coyle & Pillow, 2008). There was one major limitation to these studies, and it was described by Frey & Determan (2004). In 2005, the SAT went through a major revision process. Frey & Determan explained the new SAT would deviate from “general reasoning ability” to testing students' knowledge of the content learned in school (as cited in Barnes, 2002).

Score Gaps

The CollegeBoard publishes the results from their SAT takers each year. Looking at the results of 2019, it is easy to see the score gaps that exist. Significant gaps appeared when looking at students of different racial/ethnic backgrounds as well as varying levels of parental education. According to CollegeBoard (2019), students with a parent who has a graduate degree had an average score that was more than 250 points higher than those students whose parents did not have a high school diploma. Likewise, there was a gap of over 300 points between the highest performing racial group, Asian, and the lowest, American Indian/Alaska Native. Similar gaps were found in ACT scores. According to the ACT (2020b), in 2019, the average score of a white student was 22.1, which is more than five points higher than the average score for an African American/Black student or American Indian/Alaska Native student. These large gaps are nearly identical when looking at scores from the previous three years. The review of the following research analyzes the racial and socioeconomic score gaps that are present in the ACT and SAT test scores.

Researchers Dixon-Román et al. (2013) explored the intricate relationship seen between SAT performance and demographic factors. The majority of the research centers around students who come from families with lower levels of income as well as the effects of race, mainly between white and Black test takers. The students in this study all graduated in 2003 and took the SAT (Dixon-Román et al., 2013). There were slightly more females represented in this group and the majority, almost 70%, were white. The next largest racial/ethnic group was Black, at 11% (Dixon-Román et al., 2013). The sample size was well over one million but since the focus of this was on Black and white students, it was reduced to about 660,000 white students and almost 122,000 Black students (Dixon-Román et al., 2013). In addition to the information above, students self-reported their grades, GPA, level of parental education, and estimated their family income. All of this information was provided to the researchers by the College Board (Dixon-Román et al., 2013).

Results regarding the impact of family income were reported. Dixon-Román et al. (2013) found a positive relationship between income and scores. As SAT scores increased so did levels of family income, for both Black and white students. For example, the mean SAT score for a student with a family income of \$15,000-\$20,000 was 896 and if the income was increased to \$50,000-\$60,000, the average score was 1013 (Dixon-Román et al., 2013). It should be noted the average income reported by Black students was between \$30,000-\$35,000 and \$60,000-\$70,000 for white students. At every income level, starting at less than \$10,000 and going up to more than \$100,000, white students had a higher average SAT score than their Black peers (Dixon-Román et al., 2013).

Results regarding the impact of race were reported. The average SAT score for Black students was 854, while it was 1062 for white students (Dixon-Román et al., 2013). The average

SAT score for a Black student never exceeded 1000, whereas the highest average score for a white student was over 1100. Both of these average scores occurred at the highest family income level, more than \$100,000. Additionally, the average score gap between white and Black students was 218 points (Dixon-Román et al., 2013). Next, Dixon-Román et al. (2013) examined SAT scores between race and income among these two groups more closely. They established the effect that poverty has on test takers to be nearly two times as large for Black students than white. More specifically, white students affected by poverty score 44 points lower, while Black students affected by poverty score 77 points lower, on average (Dixon-Román et al., 2013). These scores drop even more when looking at extreme levels of poverty. On average, white students score 48 points less while Black students score almost twice that amount at 92 points lower (Dixon-Román et al., 2013). There were a few limitations to this study. First, much of the information was self-reported by students, with SAT scores being an exception. Second, the family income options were presented in increments of \$10,000 and limited to a maximum of \$100,000. Next, other important factors such as test preparation, family wealth, and socioeconomic variables of grandparents were not accounted for. Last, Dixon-Román et al. (2013) recognized the need for more information regarding other racial and ethnic groups, like Asian Americans and Hispanic/Latino.

In a review of studies, Zwick (2019) also examined test score gaps. Looking at data provided by a nationwide, longitudinal study of students from the 2004 graduation class, as reported by Ingles et al. (2005), we see significant gaps between racial and ethnic groups. The largest gap was between Asian American and Black students. Using test scores for College Board, Zwick (2019) identified the average SAT score for Asian Americans to be 1223 while for Black students it was 946. Using test scores provided by the ACT Inc., Zwick (2019) identified

the average score for Asian American students to be 24.5, and for Black students it was 16.9. This means the SAT score gap was 277 points and 7.6 points for the ACT. This was about 60 points larger than the gap Dixon-Román et al. (2013) reported finding between white and Black students.

Using the same data, Zwick (2019) reported large differences amongst socioeconomic groups. In this study, socioeconomic status consisted of family income and the careers and education levels of parents. As the level of socioeconomic status increased, so did SAT scores (Zwick, 2019). This was the same conclusion Dixon-Román et al. (2013) drew. Additionally, when looking at socioeconomic status along with race/ethnicity proved similar results as Dixon-Román et al. (2013). The average SAT score for white and Asian students ranked in the lowest socioeconomic status quartile was 949 (Zwick, 2019). Those scores were much higher than the average SAT scores for the two lowest performing groups, Black and Hispanic, whose average SAT scores were 793 and 844 respectively, at the same socioeconomic level (Zwick, 2019). This gap remains when looking at varying levels of socioeconomic status. At the highest socioeconomic quartile, Asian and white students again have the highest average ACT scores at 1177 and 1106, respectively. At this same socioeconomic level, the average score for a Black student was 930 (Zwick, 2019). Amongst all racial/ethnic groups and socioeconomic level, the average score for a Black student was the only one to never exceed 1000, which Dixon-Román et al. (2013) reported as well (Zwick, 2019).

Card and Rothstein (2007) explored the consequences segregation has on the achievement of black students. They used data from the graduating classes of 1998 to 2001, which was well over two million, as well as self-reported family characteristics and high school identifiers. Card and Rothstein (2007) narrowed their data to include only states with high levels

of participation on the SAT. The student scores were then separated into 331 different urban areas, considered either segregated or integrated. These urban areas include some of the largest cities across the US: New York, Tallahassee, Jersey City, Tampa, Philadelphia, and Fort Worth. Both school and neighborhood segregation were examined (Card & Rothstein, 2007).

Overall, Card and Rothstein (2007) found a strong negative relationship between segregation and the SAT scores of Black students. The average SAT score in the urban areas studied was 1033. However, the Black-white score gap was 193 points (Card & Rothstein, 2007). This means, on average, Black students score 193 points less than their white peers. This score gap is slightly less than the 218-point gap Dixon-Román et al. (2013) reported. Additionally, this gap "... will vary with the relative segregation of schools and neighborhoods..." and the score gap is higher in more segregated cities (Card & Rothstein, 2007, p. 2180). Interestingly, Card and Rothstein (2007) reported moving from a very segregated school to a very integrated school would raise the SAT scores of Black students by 142 points, lessening the gap between them and white peers by 70% (p. 2172).

Using data from the Texas Schools Microdata Panel (TSMP), Thomas (2004) examined the score gaps amongst white and minority students. In addition to SAT and SAT II writing scores, the TSMP also provided educational histories and family background characteristics. Thomas (2004) used data from the graduating class of 1998, which include over 7,600 students. Over half of these students were white. The next largest racial/ethnic groups were Asian and Hispanic. There was only data available for about 350 Black students, which is significantly less than the other groups (Thomas, 2004). SAT II writing scores were used because these tests are considered achievement tests while the SAT is more of an aptitude test (Thomas, 2004).

The mean SAT verbal score was 630, while the mean score for the SAT II writing was 594. There are large discrepancies between the racial/ethnic groups (Thomas (2004). The average SAT score for a white student was 649, while it was only 624 for Asian students, 580 for Hispanic students, and 574 for Black students. Thomas (2004) was curious if similar gaps still existed when using a more curriculum-based test, like the SAT II writing. The mean writing score was 594. For white students, the mean was 614, while it was only 588 for Asian students, 544 for Hispanic students, and 533 for Black students. After establishing these gaps, Thomas (2004) wanted to explore the effects of variables like family background and student academic performance.

When Thomas (2004) controlled for the family income and academic performance variables, the gap lessened but still existed. For both Hispanic and Black students, there was a gap of 47-48 points when compared to their white peers for the SAT II writing. The gap was only 37 points for Asian students. Thomas (2004) hypothesizes that English proficiency and quality of high school could further explain these gaps. Thomas (2004) concluded the only way to reverse these gaps is to give Black students the same characteristics, like family income and high school quality, as their white peers (p. 1132).

The results reported by Zwick (2019), Dixon-Román et al. (2013), and Card and Rothstein (2007) yield many similarities. There are significant test score gaps amongst racial and ethnic groups, especially for Black students. Similar gaps between white and minority students also exist in the SAT II writing test scores (Thomas, 2004). Socioeconomic factors, like family income or background, also correlate with test scores. Zwick (2019) summarizes that although these differences in scores are concerning, they are not new. Zwick (2019) suggests colleges and universities use caution when looking at these scores because using them may "... lead to lower

selection rates for Black, Hispanic, and Native American applicants, as well as candidates from low-income families.” (p. 138).

In 2003, the Harvard Educational Review published a controversial article on SAT bias (Santelices & Wilson, 2010). Seeing the disparate scores between minority students and white students, like the gaps presented previously in this section, Freedle (2013) wanted to provide minority and disadvantaged students with an opportunity to better show what they know and can do on the SAT (p. 1). His research sought to prove that the SAT is biased and then present a way to score the SAT to correct these biases. He explained that “cultural familiarity” and “semantics ambiguity” cause bias which results in lower scores for minority students (p. 2). Freedle (2003) suggested scoring the harder verbal and quantitative questions differently because minority groups and disadvantaged whites tend to perform better on those questions. Freedle’s new scoring method was not well received by the makers of the test (Santelices & Wilson, 2010). In 2010, Santelices and Wilson attempted to confirm or deny Freedle’s research with their own. They used more recent data using more current data from 1994 and 1999. Although they could not confirm all of Freedle’s results, they did find a similar correlation as he did in the verbal subtest between white and African American students. Because of this, Santelices and Wilson recommend the testing industry study this issue in order to correct it (Santelices & Wilson, 2010). The issues with these score gaps and score differences raise questions regarding the validity and fairness of the SAT, especially because of the impact these scores have on the future of each student who takes the test (Santelices & Wilson, 2010).

Predictive Power of the SAT

The use of these test scores as predictors of college success has been constantly questioned by researchers. College success can be measured in several ways, but studies most

frequently look at course grades, GPA, and graduation rates. The purpose of these admission assessments is to provide colleges and universities with objective data that can be used to compare students' readiness for college. The benefit to using SAT or ACT is that students from across the country all take the exact same test and are scored with the exact same guidelines. This cannot be said for other common data points that institutions look for, like high school GPA. Much of the research predicting college success compares the use of these scores to high school grades.

Two studies, completed by Geiser and Studley in 2002 and Geiser and Santelices in 2007, tackled the complicated relationship between SAT scores and college success. Both studies used the same data set: freshman enrollees from the fall of 1996 to the fall of 1999 at the University of California. This includes students from all of their campuses which was nearly 80,000 (Geiser & Studley, 2002; Geiser & Santelices, 2007). Since the Geiser and Santelices study serves as a follow up to the Geiser & Studley study, the studies did differ slightly. Geiser and Studley (2002) used student HSGPA (high school GPA) and scores on the SAT I and SAT II tests to predict college GPA for the first year. SAT I is the traditional SAT test and the SAT II tests are the subject specific tests. Geiser and Santelices (2007) used the same assessments but compared them to cumulative college GPA and four-year graduation rates. They chose these factors because they were long term measures of success. Both studies were concerned about the effect of family income and socioeconomic status on scores. Geiser and Santelices (2007) controlled their study for certain variables like socioeconomic status and the educational background of parents.

Geiser and Studley (2002) reported SAT II scores were the best predictor of freshman GPA. They compared the "... percentage of explained variance in [GPA]..." to determine their

results (Geiser & Studley, 2002, pg. 5). The SAT II scores accounted for 16% of the variance, while HSPGA and SAT I scores accounted for 15.4% and 13.3% respectively (Geiser & Studley, 2002). Combining these factors had little effect. When SAT II scores are looked at along with HSGPA, 22.2% of the variance would be accounted for while all three factors together would account for 23.3%. This means a little less than 80% of freshman GPA is accounted for. Of the seven campuses in the UC system, six of them saw this same pattern. The pattern also held true across the intended majors of the students (Geiser & Studley, 2002).

Geiser & Studley (2002) were curious about the impact of socioeconomic factors and race/ethnicity. When looking at family income and parents' education, the SAT II tests were "less sensitive" to these background factors when compared to the SAT I tests (Geiser & Studley, 2002, pg. 24). Additionally, Geiser and Studley (2002) grouped students by the following racial/ethnic groups: African American, American Indian, Asian American, Chicano/Latino, and white. Using the percent of variance accounted for, they found the SAT II tests to be better predictors of freshman GPA than the SAT I tests in every racial/ethnic group except for the Chicano/Latino group. When combining HSGPA and SAT I scores, the SAT II tests were still better predictors of grades. Also, HSGPA alone was a better predictor than SAT II scores for only two groups, white and Chicano/Latino (Geiser & Studley, 2002).

The findings from Geiser and Santelices (2007) were slightly different. First, they reported HSGPA was the best predictor of cumulative college GPA. HSGPA accounted for 20.4% of the variance, while SAT II scores and SAT I scores accounted for 16.9% and 13.4% of the variance respectively. Combining all of these factors together would account for 26.5% of the variance (Geiser & Santelices, 2007). This means that a little over 70% of the variance does not have to do with these scores. Geiser and Santelices (2007) explained that many other factors

affect student performance, like "... financial aid, social support, and academic engagement in college." (p. 12). The models used included socioeconomic and background variables. Like the 2002 study, Geiser and Santelices (2007) found these results to be consistent among the different UC campuses and academic fields with one exception. In subjects that require "math-based knowledge," the SAT II math scores were the stronger predictor of cumulative grades (Geiser & Santelices, 2007, p. 12). Another area Geiser and Santelices (2007) studied was fourth year GPA. They thought the variance would decrease over time due to the factors that negatively affect student performance in college cited above. However, their predictions improved after the first year. The variance slightly increased for every year after the first year albeit only a 3% increase. Geiser and Santelices (2007) hypothesized that HSGPA best predicts not only cumulative GPA but the GPAs of each individual year because it reflects the structure of high school. High school includes several different classes taken over the same number of years, like college, where the SAT scores come from a hours-long test taken in one day. The last area Geiser and Santelices (2007) were interested in was college graduation. Like previous results, HSGPA was the best predictor of college graduation in four years. Additionally, using HSGPA along with SAT I and II scores yield a better prediction than any of those factors alone. At all eight of the UC campuses, HSGPA served as a better predictor than SAT I scores. With the exception of two campuses, HSGPA was also a better predictor than the SAT II scores (Geiser & Santelices, 2007).

Like Geiser and Studley (2002), Geiser and Santelices (2007) were curious about how socioeconomic factors affected their results. While researching how HSGPA and test scores contribute to GPA and graduation rates, they included family income and parents' education. They found high school grades to be less correlated with socioeconomic status than the SAT

scores. The correlation between HSGPA and family income and parents' education were weak where the correlation between SAT scores and those factors demonstrated "...a strong, positive relationship..." (Geiser & Santelices, 2007, p. 26). Since HSGPA has less of an impact on students from families with lower income or education, Geiser and Santelices (2007) determined that using HSGPA would create a more fair and equitable admission decision.

Using the same data from the University of California system, Geiser and Santelices (2007) and Geiser and Studley (2002) both reported the SAT can, to some degree, predict college performance; it is not as strong a predictor as HSGPA or the SAT II tests. Additionally, both sets of researchers noted the effect of student socioeconomic factors.

Another study was completed by Zwick and Sklar in 2005. They investigated the effects ethnicity and first language had on SAT scores and high school grades. They broke their 10,000 students into four groups: Hispanic students whose first language was Spanish, Hispanic students whose first language was English, white students whose first language was English, and Black students whose first language was English. The largest group by far was white students. The other groups had between 1,000 to 2,000 students. This study used old data with students who were sophomores in 1980 (Zwick and Sklar, 2005). The lack of current data does represent a limitation of the study along with the fact that Spanish was the only other language included. Although the groups used in this study were more specific than the University of California data, similar findings were reported. First, high school GPA along with SAT scores accounted for 22% of the variance in freshman GPA with HSGPA being stronger than test scores (Zwick and Sklar, 2005). This is very similar to the results Geisler and Studley (2002) reported. Their research found that HSGPA in combination with SAT I and SAT II scores accounted for 23.3% of the variance in first year GPA. Zwick and Sklar (2005) found higher high school grades and higher

SAT scores to be associated with higher rates of graduation. SAT and HSGPA affected the student groups differently in terms of graduation. HSGPA and SAT scores had a statistically significant effect for the white group when only SAT scores had the effect for the Hispanic/English group. Additionally, the prediction of freshman GPA for students in the Hispanic/Spanish group was much weaker than any of the other three groups (Zwick & Sklar, 2005).

As in the previous studies, Berry and Sackett (2009) were interested in the relationship HSGPA and SAT scores on college performance. Their data included over 150,000 students from the years 1995, 96, and 97. Colleges provide the GPAs and class grades, College Board supplied the SAT scores, and students self-reported their HSGPA (Berry & Sackett, 2009). Their findings were not significantly different from the studies mentioned previously. Berry and Sackett (2009) found SAT scores and HSGPA accounted for about 28-36% of the variance in cumulative GPA and between 30-40% of the variance in freshman GPA. These percentages are slightly higher than those discovered by Zwick and Sklar (2005). Berry and Sackett (2009) found a moderately positive correlation between cumulative college GPA with SAT scores and HSGPA, 0.424 and 0.472 respectively. They concluded that SAT scores and HSGPA are both helpful numbers and should be used by colleges and universities when making admission decisions (Berry & Sackett, 2009).

Lastly, in 2019, College Board researchers Westrick et al. (2019) examined the usefulness of the SAT in predicting college success. Although this study was published by College Board, which may be biased since they administer the SAT tests, they used data from the most recent and updated version of the SAT test where the studies mentioned previously used older versions of the test (Westrick et al., 2019). Westrick et al. (2019) used data from 171 four-

year colleges and universities. The institutions were public and private and located across the U.S. There was a wide range of selectiveness and number of students. These colleges and universities provided researchers with a sample size of over 220,000 students. The students also demonstrated diversity. A little less than half of the students were white. The next biggest racial/ethnic groups were Hispanic/Latino at 25% and Black/African American at 13%. The number of female and male students was close to equal. Additionally, the parental education of parents ranged from no high school diploma to a graduate degree. No socioeconomic factors were included in this study. Students self-reported their HSGPA, College Board provided SAT scores, and the individual colleges gave the GPA and retention information.

In their first set of results, Westrick et al. (2019) determined that SAT scores do correlate with freshman GPA. There was a conservatively positive, 0.51, correlation using only SAT scores. However, using HSGPA demonstrated a slightly higher correlation of 0.53. Using both of these scores gave the highest correlation at 0.61. These correlation values are higher than the ones revealed by Berry & Sackett (2009) but not by much. Berry & Sackett (2019) identified a correlation between cumulative GPA and SAT scores of 0.424 while using HSGPA was 0.472. Like Berry and Sackett (2009), Westrick et al. (2019) recommends using both HSGPA along with SAT scores like this study does. Interestingly, Westrick et al. (2019) found as SAT scores improve so does the students freshman GPA.

In their second set of results, Westrick et al. (2019) chose to analyze the retention of freshman students. They used the same data provided by the College Board and the individual colleges but had slightly fewer institutions, 156, and students, 204,504, participated. Westrick et al. (2019) identified a positive relationship among retention and SAT scores: as SAT scores

increased, so did the retention rates. Likewise, students with higher HSGPAs and freshman GPAs came back for their second year.

In another study, measuring how well the SAT predicts grades in college, Coyle et al. (2011) wanted to know if a student's intelligence affected the validity of these predictions. The subjects for this study were taken from 1997. This is the same data set used by Coyle and Pillow (2008) in their study on the relationship between the SAT and intelligence. Although there were nearly 9,000 people who took the 1997 survey, only data from a little over 700 subjects was used. There was a close to equal number of females and males and the ages ranged from 12-16. These subjects were then split into two groups: high ability and low ability. Coyle et al. (2011) used scores from the ASVAB to split students. The ASVAB is an assessment including 12 subtests that are highly correlated with intelligence. Students with scores that were more than the average were considered high ability. Students with a score that was below the average were placed in the low ability group. All students had SAT scores and then self-reported their college GPAs for their first two semesters.

After analyzing their results, Coyle et al. (2011) found a difference in how well the SAT predicted GPA in the two groups. For both of the SAT subtests and the overall score, the correlation between college GPA and test scores was higher in the high ability group than the low. The correlation between GPA and SAT scores was 0.35 in the high ability group while it was 0.19 in the low ability group. When looking at the two subtest scores, the correlation for verbal was more in both groups at 0.34 and 0.20 for the high and low groups respectively. For math, the correlations were 0.28 and 0.14. It is hard to compare these results with the correlations provided by Berry and Sackett (2009) and Westrick et al. (2019) because they all varied slightly in their methodology. Berry and Sackett (2009) looked at cumulative college GPA and Westrick

et al. (2019) looked at freshman GPA. However, the correlations found by Coyle et al. (2011) were not as strong as the other two studies overall. Even the strongest correlation, 0.34 for the high ability group on the verbal test, was still lower than the 0.51 correlation identified by Westrick et al. (2019) and the 0.424 found by Berry and Sackett (2009).

Like Geiser and Studley (2002) and Geiser and Santelices (2007), Rothstein (2004) also investigated the effect student and school background factors had on the relationship between SAT scores and freshman GPA. Rothstein used a large data set from the University of California, which is similar to Geiser and Studley (2002) and Geiser and Santelices (2007). Over 18,000 students had complete records and were all California residents who attended any of the campuses in the University's system. All of these students graduated in 1993 and had available SAT scores. Rothstein (2004) noted a limitation here because the verbal and math subtests scores were not included, only the composite score. The sample of students was nearly equal between females and males. It was also a racially diverse sample. Almost 40% of students were Asian, 14% were Hispanic, and 4% were Black. The background factors included in the research included race, parental education, and if students receive free lunch (Rothstein, 2004).

Rothstein (2004) concluded the background variables accounted for a considerable portion of the variance in SAT scores. They were also effective predictors of freshman GPA. The combination of HSGPA and background factors (race, parental education, and free lunch) accounted for 45% of the variance in freshman GPA (Rothstein, 2004). This is about as much as using SAT and HSGPA predicted, without those factors. Last, Rothstein (2004) found at the individual and school level, these background factors are more related to freshman GPA than SAT scores. Rothstein (2004) explains how these high percentages prove background factors of students and their high schools can serve as a substitute for SAT scores. Because of this he

recommends the SAT scores not serve an important role in admissions decisions because so much of the score is attributed to background variables (Rothstein, 2004).

The results of the multiple studies summarized above paint a confusing but interesting picture of SAT use in predicting college performance. Each study differs in how they measured performance in college but most used freshman or cumulative GPA. Some studies were curious as to the effects of socioeconomic status, family background, or race/ethnicity and some did not discuss these factors. The results of Westrick et al. (2019) do not vary much when compared to Berry and Sackett (2009). Both suggested the reliable use of SAT scores and HSGPA when predicting college performance. However, the correlation revealed by Coyle et al. (2011) was lower. The results of Geisler and Studley (2002) and Geiser and Santelices (2007) contrasted this. The usefulness of SAT scores used as predictors of success were not strong or recommended by them.

Predictive Power of the ACT

Like the SAT, the ACT measures the college readiness of test takers. The ACT score gives one objective data point that colleges and universities can use to determine admission. Similar to the SAT studies presented above, the following research examines the relationship between ACT scores and college success.

In a large study conducted among students in the Chicago Public School District, researchers Allensworth and Clark (2020) examined the relationship between high school grades and ACT scores when used as predictors for graduation. They also wanted to know if the actual high school students attended had any effect on those relationships. The Chicago Public School District is diverse in many ways. There are top ranking schools nationally as well as schools with low test scores. Allensworth and Clark (2020) used students who graduated from any of their

high schools, whether they be magnet, vocational, or neighborhood schools, in 2006 through 2009. The students had to be enrolled in a four-year college or university. The final sample included over 17,000 students. The school district provided researchers with student information such as gender, race, ethnicity, HSGPA, and ACT scores. Information regarding the socioeconomic status of the different neighborhoods was also used. Graduation rates were provided by the National Student Clearinghouse (Allensworth & Clark, 2020).

Allensworth and Clark (2020) results proved HSGPA had a strong relationship with college graduation rates where ACT scores showed a weak relationship. They also found with higher ACT scores, like 30 or more, they were the weakest. This was true across all of the high schools in this study (Allensworth & Clark, 2020). The location of the high school or which high school students attended also proved to matter. Allensworth and Clark (2020) concluded "... that students with either the same HSGPA or the same ACT score graduate from college at different rates, based on which high school they attended." (p. 209). Because of this, Allensworth and Clark (2020) recommend colleges and universities evaluate a student's level of college readiness using their high school's average ACT score since it would give a better prediction than their own score. Allensworth and Clark (2020) provided many theories as to why ACT scores are related to individual high schools. Not every high school has the same number of advanced placement or college level classes. Schools, even in the same district, serve neighborhoods with varying socioeconomic backgrounds (Allensworth & Clark, 2020).

At a small university in the Midwest, Saunders-Scott et al. (2018) investigated the impact ACT scores had on college GPAs. Compared to the previous study of Chicago students, this one used a much smaller sample of 165 students. The majority of students, who were volunteers, were female and average age ranged from 19 to 24. Although this sample was a good

representation of the school as a whole, nearly 90% of students were white (Saunders-Scott et al., 2018). These participants were given a questionnaire and self-reported their HSGPA, ACT score, and current college GPA, which is a limitation for this study. Also in this questionnaire were questions related to stress and grit. Since Saunders-Scott et al. (2018) also wanted to analyze retention, student enrollment was provided by the university.

After analyzing their research, the results of Saunders-Scott et al. (2018) were quite similar to Allensworth and Clark (2020). Saunders-Scott et al. (2018) reported HSGPA to be more highly correlated with college GPA than ACT scores. That correlation was 0.33 compared to a 0.26 correlation between college GPA and ACT scores. In terms of the level of variance, HSGPA accounted for 12.2% of college GPA where ACT scores accounted for 1.6% of the variance (Saunders-Scott et al., 2018). Like the variance accounted for in many studies of the SAT, this means there is a large variance unaccounted for. Interestingly, when examining retention, Saunders-Scott et al. (2018) found the best predictor by far was not HSGPA or ACT scores but stress.

In addition to their investigations on non-cognitive factors, Schmitt et al. (2009) examined the correlation between cognitive factors, like SAT/ACT scores and HSGPA, and college performance. The research included over 2,000 students from a range of large colleges and universities in 2004. The institutions included were both public and private and included historically Black colleges and universities. Schmitt et al. (2009) were provided with HSGPAs and SAT/ACT scores by the schools. The original sample, although mainly white, included minority students, mainly African American, Hispanic, and Asian (Schmitt et al., 2009). The lack of diverse students does represent a limitation of the study. Some of the colleges that minority students attended did not end up participating.

The results did not differentiate between the SAT and ACT, but instead scored them together. Schmitt et al. (2009) reported test scores and HSGPA have high levels of validity in predicting college grades. The correlations between both factors were extremely similar. Between HSGPA and cumulative GPA, the correlation was 0.531. For cumulative GPA and ACT/SAT scores, the correlation was 0.539. The results among HSGPA correlations are mostly consistent with previous studies although Schmitt et al. (2009) reported higher correlations. However, a large difference is the correlation among ACT/SAT scores. A correlation of 0.539 was quite high in comparison to other studies that found much smaller correlations (Schmitt et al., 2009). Much like the findings among SAT scores and HSGPA, the ACT results are also unclear. This makes it hard to develop a solid conclusion on the predictive powers of the ACT and SAT tests on college performance.

Impact of Socioeconomic Factors

The connection between socioeconomic status and student achievement, like GPA and SAT scores, is difficult to describe. Zwick (2019) explains why by writing, “Student academic performance reflects the enormous variation in educational resources and opportunities across the communities in this country” (p. 137-138). The research in the previous sections included the findings related to socioeconomic variables occurring at both the family level and high school level. These variables have implications for SAT and ACT test scores and test preparation options and opportunities.

Researchers have found connections between high school characteristics and academic performance. For example, Zwick and Green (2007) found, through their research on 2004 high school graduates, a positive relationship between higher socioeconomic schools and SAT scores. Schools with higher socioeconomic status had higher average SAT scores (Zwick & Green,

2007). Additionally, Rothstein (2004) reported a significant relationship between SAT scores and college GPA among high school characteristics like poverty, racial makeup, and student background. These findings, though, are not new to researchers because of the consistent evidence that school resources can positively influence student educational outcomes (Zwick, 2019).

CollegeBoard, the organization responsible for the SAT, has acknowledged these score gaps and published their own research on the socioeconomic status of students. Mattern (2008) et. al. used the 2007 database of high school seniors, which was close to half a million, to determine and analyze the correlation between SAT score and socioeconomic status. The database included the student's SAT score, high school performance factors, and socioeconomic status, which include parent education and family income. The results of this study showed a positive correlation between SAT scores and socioeconomic status (Mattern et al., 2008). However, Mattern (2008) et al. states that it is misleading to call the SAT a "wealth test" because HSGPA and rank also had positive correlations with scores, just slightly smaller. Like Zwick (2019), CollegeBoard explains these gaps and correlations exist because students from higher income families have more resources that can positively affect their education. Mattern (2008) et al. suggests there are not issues with the SAT itself, but with the lack of equity in education all together.

In a massive 2019 report, it was reported that schools serving mainly students of color are, and have been, historically underfunded (EdBuild, 2019). The lack of funding leads to fewer resources, access to AP classes, and other educational resources for the students with the most need. The report stated nonwhite school districts receive \$23 billion less than the districts that serve white students (EdBuild, 2019). Although the issue of educational funding is just an issue

for the SAT or ACT, colleges and universities need to recognize that white students from well-funded schools have better access to educational opportunities.

Colleges and universities recognize the issues with using test scores as significant factors for admission. Many of them have started to de-emphasize the impact of SAT and ACT scores. Zwick (2019) explained how percent plans help lessen the use of test scores. In these programs, any student with a very strong GPA based on rankings within their high school are automatically admitted. Also, schools across the United States are adopting test optional practices. In 2018, the University of Chicago went away with ACT and SAT score requirements (Zwick, 2019). The goal of policies like these are to increase diversity and provide more opportunities to low-income students.

Although test-options practices are becoming more popular than before, there is already research to back up this approach. A study completed in 2014 compared students who submitted a standardized test score, ACT or SAT, to those who didn't, when looking at test-optional schools (Franks & Hiss, 2014). This study found no significant differences in the college GPA or graduation rate of those who did or did not submit a score. There was a strong correlation between high school GPA and college GPA. The most interesting part of the study reports students who were most likely to not submit a standardized test score were first generation, women, and all categories of minority students (Franks & Hiss, 2014).

CHAPTER III: DISCUSSION AND CONCLUSION

Summary

The research presented in the previous chapter responded to the guiding questions surrounding the use of standardized test scores in college admissions. The research has indicated what educational professionals and researchers have long critiqued about the SAT and ACT: that they are not the best predictors of college readiness for a variety of reasons. The research has shown that SAT or ACT scores are strong reflections of so many other factors than academic achievement.

A common theme in the research is the impact of demographic factors, like family income and race. Data from both the SAT and ACT show significant score gaps between white and minority students, especially students who are Black, Hispanic, or Native Alaskan/American Indian (ACT, 2020b; CollegeBoard, 2019). Even when family income remained the same, Black students scored lower than their white peers (Dixon-Román et al., 2013). There is both a racial and income gap for the ACT and SAT. Unfortunately, education can get students out of poverty, but they must first have more opportunities, which include access to a high-quality education from a four-year college or university. Additionally, test preparation, especially private tutoring, have been shown to improve test scores (Buchmann et al., 2010). However, many of these private agencies are very expensive and are not an option for students from less advantaged backgrounds.

Researchers have questioned whether using the SAT or ACT as admissions criteria provides a valid measure of college readiness when their score on an hours-long test can be

increased to a significant degree. This logic is why many colleges and universities have moved to a test optional admissions process and use high school rank and GPA, which assesses a student over four years of school, as admission criteria. Research has proven that using a high school GPA is a better predictor of college success than test scores. Geiser and Santelices (2007) reported a student's high school GPA was the best predictor of first-year college GPA, cumulative GPA, and college graduation rates. The study reports that "High-school grades provide a fairer, more equitable, and ultimately more meaningful basis for admissions decision-making..." (Geiser & Santelices, 2007, p. 27). Looking at a student's performance over four years is more reliable than a test score on a test when considering some students are not good test takers, have test anxiety, and have different processing speeds.

Professional Application

This literature review has shed light on the standardized testing industry as a whole, not just the SAT and ACT. All states in our country use one or more types of standardized tests to measure academic achievement. This starts in the early elementary grades. For example, in my current school district, students take the Minnesota Comprehensive Assessments and also the Measures of Academic Progress assessments. Much of the research presented in this literature review could be used as reasoning to limit or end standardized testing in our nation's schools altogether because the criticisms and inadequacies presented in the last chapter are not exclusive to the SAT and ACT. As more and more colleges and universities become test-optional, there is hope that public school testing practices may change as well.

Nearly all standardized academic assessments, including the ones we take in Minnesota, have faced similar questioning and judgment as the SAT and ACT. Teachers, parents, and others have wondered if our system gives too many standardized tests and if these tests take up too

much instructional time from our students. At my school, our eighth graders took seven standardized tests this year. Additionally, students in intervention classes took one to two more than that. In their research, Rasmussen and Chamley (n.d.) reported students will have been given more than 20 standardized tests by the end of eighth grade, accounting for about 90 days. It is hard to argue for something that sacrifices so much instructional time. Another common question asked is if a single score on a standardized test that lasts a few hours should be valued more than scores on assessments that reflect the learning objectives of teacher lessons. Like the SAT and ACT, these tests have important consequences since they can be used to place students in advanced or remedial classes. The questions regarding validity and bias are the same. When looking at the MCA results, very similar racial gaps exist in test scores. According to the Minnesota Department of Education (2017), 69% of white students met or exceeded the reading standards compared to 33% of Black/African American students. In math, the gap widens. In 2017, 68% of white students met or exceeded compared to only 28% of Black/African American students.

Standardized admissions testing is a topic for teachers to be aware of because it directly affects each child sitting in our classrooms, even in elementary and middle schools. The goal of high school is to graduate students who are prepared for a post-secondary education, but this preparation starts their very first day of kindergarten. A traditional four-year institution is not the only path for students to find success, but it does offer opportunities we want each child to have. In order for this to happen, teachers, parents, administrators, other educational professionals, and even students need to become advocates. They need to advocate for reduced testing, no testing, or fair testing but also equal funding and increased equity among schools in their own state and school districts. As teachers, we care about our students, the people they become, and the futures

they are building. However, some students are given better opportunities than others and that is not fair.

Limitations of the Research

The research included in this literature review was published between 2001 and 2020. The research, SAT or ACT scores, or other important information from the 2019-2020 school year and beyond was not included. This was purposeful as the COVID-19 pandemic drastically affected the academic progress of students. Students from across the country as well as the state of Minnesota did not all attend in-person school as many were distance learning for extended periods of time and did not take any standardized tests. Although students from all over the world take both the SAT and ACT, the research did not include any schools or students from outside of the United States. However, information from the SAT, ACT, or CollegeBoard websites would include data from those students. The most recent research studies were prioritized. In general, there was more research on the SAT than the ACT, which was unexpected. There was also a lot of research published in the 1980s and 1990s, compared to the 2000s, that was not included. Interestingly, numerous studies used data from students attending the University of California schools. Similarly, several authors wrote multiple papers on these topics. In order to not be repetitive, the number of studies by the same author or from the UC system used in this review was limited. A large majority of the research was quantitative, but a few qualitative studies were found while searching. However, only the quantitative studies were included in the literature review.

Implications for Future Research

There is still a need for research on the SAT and ACT, especially related to the income and race gaps that exist. In particular, the amount of research on the impact of race and

socioeconomic factors, like family income and parental education was not as prevalent for the ACT as research on SAT scores and those factors. Additionally, more focused research on smaller sample sizes, for example, students from the same high school or the same school district, would be helpful. The educational systems across the country, and even among individual states, are so different that it would be interesting to look at a more concentrated data set. Also, it would be beneficial for educational researchers to examine and understand the impact the pandemic had on student academic achievement. We know the COVID-19 pandemic has disproportionately affected certain populations and it would be interesting to see if those same groups of students were affected, in terms of their SAT and ACT test scores. Last, with test-optional admission processes becoming more and more popular, more research on how those practices affect student admittance and college success, with an emphasis on minority and low-income students, should be completed.

Conclusion

In this literature review, issues related to the use of ACT and SAT scores in college admission decisions were analyzed. These tests are fixtures in the educational journeys of high school students. There was much research that showed the inadequacies of these tests and validated the questions asked by many about whether or not these tests measure what they are intended to measure. This review displayed the research proving the biases of the SAT and ACT. Colleges and universities can now do a better job of determining college readiness. The trend of test-optional admissions has increased equity. However, test-optional schools are not the answer to the issues that extend beyond the ACT and SAT. This literature review also exposed the unfair advantages some students have because of the color of their skin or where they attend school.

The research presented addressed just one problem in the overwhelming issue of inequities in our education system.

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