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A Longitudinal Examination of African American Adolescents' Attributions about Achievement Outcomes

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Abstract

Developmental, gender, and academic domain differences in causal attributions and the influence of attributions on classroom engagement were explored longitudinally in 115 African American adolescents. In Grades 8 and 11, adolescents reported attributions for success and failure in math, English and writing, and science. In Grade 11, English and mathematics teachers rated students' classroom engagement. Boys were more likely than girls to attribute math successes to high ability and to attribute English failures to low ability. Both genders' ability attributions for math became more negative from eighth to eleventh grade. Grade 8 attributions of math failure to lack of ability were negatively related to Grade 11 math classroom engagement. Results illustrate the gendered nature of motivational beliefs among Black youth.

African American girls outperform African American boys on numerous achievement indices. For example, compared to African American boys, African American girls obtain higher grades, experience fewer grade retentions, value school more highly, report stronger intentions to finish high school, and achieve higher graduation rates (Garibaldi, 1992; Graham, Taylor & Hudley, 1998; Hefner, 2004; Jordan & Cooper, 2003; Mickelson & Green, 2006; Saunders, Davis, Williams, & Williams, 2004). However, these gender differences are more nuanced when considering academic domains as opposed to domain-general achievement and achievement motivation. In our own work, we have found that African American girls report more positive academic self-concepts in literacy areas than African American boys, who tend to view their mathematics and science performance more favorably (Evans, Copping, Rowley, & Kurtz-Costes, 2011).

In the present study, we explored gender, developmental, and academic domain differences in the causal attributions of African American youth and the relation between these attributions and youths' classroom engagement. Our goals were to test assumptions of attribution theory and to use attribution theory as a framework to better understand motivational processes in Black youth. A basic tenet of attribution theory is that individuals' interpretations of their successes and failures influence their subsequent motivation (Weiner, 1985). Little research has examined developmental change in attributions across the high

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school years, possible linkages between societal gender norms and attributions, and the relation between attributions and classroom engagement. The present study was designed to address those gaps.

Attribution Theory and Attribution Research with African Americans

According to attribution theory (Weiner, 1985, 1986), individuals try to master their environments by understanding the causal determinants of events. The perceived causes of academic successes and failures (e.g., luck, ability, effort) are categorized according to their locus, stability, and control; these dimensions are posited to determine the psychological and behavioral consequences of attributions (Weiner, 1985, 1986). For instance, a student who attributes a failing exam grade to late-night partying and little sleep might experience guilt, regret, or embarrassment, in contrast to the anger experienced by a student who attributes failure to unfair grading by the professor. *Locus* of causality refers to whether the cause of a success or failure is internal (e.g., ability) or external (e.g., task difficulty) to the individual. *Stability* refers to whether a cause is stable or unstable, and therefore is most strongly linked to expectancy for future success. For example, ability is perceived as internal and stable, whereas luck is viewed as external and unstable. Finally, the cause of the success or failure may be either *controllable* (e.g., the amount of effort deployed on a task) or uncontrollable (e.g., luck).

Sandra Graham (1988; Graham & Long, 1986) has presented a strong theoretical justification for the value of attribution theory in understanding the achievement motivation of Black youth. Most of the early research on attributions in Black youth was racially comparative. In her comprehensive 1994 review, Graham concluded that there is no evidence that the attributions of Black youth differ significantly from those of Whites. Moreover, she suggested that researchers should move beyond race-comparative designs to within-race studies that test aspects of classic attribution theory such as the relation between attributions and subsequent academic motivation.

Attribution theorists posit that when explaining success, internal and stable attributions promote future engagement because in that case individuals are more likely to anticipate future success (Graham & Long, 1986; Weiner, 1985, 1986). Conversely, when explaining failure, attributions to causes that are external and unstable, such as luck, are more adaptive because attributing failure to an internal, uncontrollable factor such as low ability leads the individual to assume that future effort is unlikely to result in success. Although attributions of success to ability are clearly considered adaptive and failure ability attributions are maladaptive, the relation between effort attributions and subsequent motivation is less straightforward. On the one hand, noting that past effort has resulted in successful performance is linked to subsequent achievement striving (Haynes, Daniels, Stupnisky, Perry, & Hladkyj, 2008; Schunk, Pintrich, & Meece, 2008). On the other hand, a belief that success is due to high effort might carry the connotations that the individual is lacking in ability, and attributions of failure to lack of effort do not necessarily guarantee that the learner will deploy greater effort in the future (Schunk et al., 2008; Weiner, 1986). Ability and effort are the causes that individuals use most frequently to explain their academic successes and failures (Weiner, 1985). In the present study, we focused on ability and effort attributions made regarding achievement in math, English, and science in order to test hypotheses about gender differences in attributions. We were also interested in determining whether and how attributions changed from late middle school to high school.

Developmental Change in Causal Beliefs

During adolescence, youth develop the ability to engage in more complex information processing and greater self-reflection (Keating, 1990). In addition, adolescence is a time

when school characteristics change markedly and when achievement outcomes become more salient as a predictor of eventual adult employment and income. In comparison to middle schools, high schools typically have more academic tracking, greater visibility of class rank, and greater importance placed on academic performance (Berkner & Chavez, 1997; Lee & Bryk, 1989).

Other changes are also occurring in addition to the changes in cognition and in the school environment. During adolescence self-perceptions become more differentiated (e.g., youth who previously viewed themselves as strong students may begin to think of themselves as relatively more capable in language than in math, or vice versa) (Marsh & Ayote, 2001). By middle adolescence (ages 15–18), youth are often preoccupied with how others perceive them (Harter, 1990), resulting in pressure to conform to more traditional gender norms (Ruble, Martin, & Berenbaum, 2006). This conformity may lead to causal attributions that reflect common gender stereotypes about differences in abilities. Thus, as youth are increasingly exposed to gender differences in career selection (e.g., the prevalence of men in engineering and the physical sciences), their causal attributions might reflect these differences (e.g., girls might be more likely than boys to attribute math and science failures to lack of ability), leading to changes in attributions that vary by gender and academic domain.

Domain and Gender Differences

A great deal of research has distinguished science, technology, engineering, and mathematics (STEM) academic domains from language arts (reading, writing) domains. Group differences in performance in STEM fields have become of interest as ethnic minority and female students tend to underperform in these areas, are less likely to enroll in advanced STEM courses, and are less likely to declare majors in STEM fields relative to their White American and male counterparts (Hoffman, Llagas, & Snyder, 2003; NAEP, 2008; Tate, 2004).

Previous research suggests that students view STEM domains as more difficult than language arts domains. Both boys and girls tend to experience motivational declines during the high school years in mathematics and science, but not in English (Chouinard & Roy, 2008; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Osborne, Simon, & Collins, 2003). On average and across diverse samples, high-school students are less optimistic about the likelihood of success in math and science than they are about success in English (Fredricks & Eccles, 2002; Jacobs et al., 2002; Ma & Cartwright, 2003; Osborne et al., 2003). These changes documented in earlier longitudinal studies led us to expect declines across the high school years in adaptive ability attributions for math and science and no change in English attributions.

Gender differences were also anticipated in students' attributions. During high school as adolescents become increasingly focused on their future educational and work force trajectories, their causal attributions about their own academic outcomes might change to reflect traditional gender stereotypes about academic domains (Kiefer & Shih, 2006; Kurtz-Costes, Rowley, Harris-Britt, & Woods, 2008). Research on youths' competence perceptions reliably shows stereotype-consistent gender differences in STEM and language arts domains. Boys tend to rate their math and science abilities more positively than girls, who tend to rate their verbal abilities higher than boys (Andre, Whigham, Hendrickson, & Chambers, 1999; Jacobs & Bleeker, 2004; Jacobs et al., 2002; Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991). Although most prior research showing gendered patterns of competence perceptions has been conducted with Whites, the available literature with African American youth shows similar results (McClendon & Wigfield, 1998; Rowley, Kurtz-Costes, Mistry, & Feagans, 2007). For instance, in McClendon and Wigfield's (1998)

study of middle school Black youth, boys reported higher perceptions of their own competence in math and science than girls. Rowley and her colleagues (2007) found that Black children of both genders rated girls as more competent in literacy than in math and science, and showed the opposite pattern in ratings for boys.

Reyna (2000) has argued that stereotypes and attributions are inextricably linked in the classroom because stereotypes convey explanatory information about academic success and failure. Because girls have historically been viewed as less competent in math and science than boys, we anticipated that boys would be more likely than girls to attribute math and science successes to ability, and English failures to lack of ability. Conversely, we expected that girls would be more likely than boys to attribute English successes to ability, and would be more likely to attribute math and science failures to lack of ability. To our knowledge, these hypotheses had not been tested in prior research.

Attributions as a Predictor of Subsequent Motivation

In addition to exploring developmental, domain, and gender differences in attributions, we also examined the behavioral consequences of attributions by exploring their relation to students' engagement (i.e., effort, persistence) at school. Several studies with college students have demonstrated the relations between attributions and achievement outcomes. For example, students' attributions at the point of college entry predict later grade point averages (Perry, Stupnisky, Daniels, & Haynes, 2008); causal attributions in foreign language courses predicted later self-efficacy and achievement (Hsieh & Schallert, 2008); and attribution retraining that focuses on students' effortful behavior as an avenue to future success has resulted in greater mastery motivation, higher course grades, and higher grade point averages among college students (Hall, Perry, Chipperfield, Clifton, & Haynes, 2006; Haynes et al., 2008; Haynes, Ruthig, Perry, Stupnisky, & Hall, 2006).

A positive attribution style has also been shown to predict subsequent classroom engagement and higher grades among high school students (Ciarrochi, Heaven, & Davies, 2007; Glasgow, Dornbusch, Troyer, Steinberg, & Ritter, 1997; Leeson, Ciarrochi, & Heaven, 2008). Chan and Moore (2006) showed that this relation between attributions and achievement is bidirectional: In their longitudinal study of Australian youth spanning the entrance to high school, helpless attributions led to lower achievement, which in turn predicted subsequent helpless attributions. The above research was conducted with predominantly White samples and did not examine attributions and achievement within academic domains. In a culturally-comparative study of French, Caucasian American, and African American seventh graders, Black youth were more likely than the other two groups to attribute academic successes to ability; however, whereas ability attributions were correlated with reading achievement among French and U.S. White youth, attributions were unrelated to achievement among the African American youth (Kurtz-Costes, Ehrlich, McCall, & Loridant, 1995). However, the limited attribution research done with African Americans does show that African American adolescents who attribute successes to stable causes tend to be more certain of future successes (Graham & Long, 1986). The long history of developmental and educational research questioning the achievement values of African Americans (see Graham, 1994) warrants consideration of the relation between attributions and subsequent school engagement in Black youth, and evidence that internal attributions tend to be strongly domain-specific warrants an examination of these questions within academic domains (Vispoel & Austin, 1995).

The Present Study

Prior attribution research with African Americans has typically not been longitudinal, has not addressed possible domain and gender differences in attributions, or examined whether

attributions influence African American adolescents' classroom motivation. These gaps were addressed in the current study through a longitudinal assessment of African American adolescents' attributions in Grade 8 and Grade 11 about personal academic successes and failures. We hypothesized the following: (1) Math and science ability attributions would become less adaptive over time (i.e., success in these domains would be attributed to ability less in Grade 11 than in Grade 8, and failure would be attributed to lack of ability more often). No systematic changes were expected in English attributions across the three years. (2) Gender differences within each domain were anticipated, with boys more likely than girls to attribute math and science success to ability and girls more likely than boys to attribute English success to ability. Moreover, girls were expected to endorse ability for English success more than they would endorse ability for math or science success, whereas boys would endorse ability for math and science success more than for English. (3) Failure attributions would also be consistent with traditional gender stereotypes, with girls more likely than boys to have maladaptive ability attributions (i.e. failure due to lack of ability) in math and science whereas boys would be more likely than girls to attribute English failure to lack of ability. Given the maturational and contextual changes during the high school years, we also hypothesized that these gender differences in attributions would increase across the three years of the study. (4) Grade 8 success ability attributions would be positively related and failure ability would be negatively related to Grade 11 engagement. Effort attributions were examined in an exploratory fashion. Although research has commonly held that attributing failures to lack of effort should result in greater subsequent engagement, there is some evidence that greater effort might be inversely related to success-ability attributions. That is, needing to work harder to do well may be associated with lack of ability and thus might lead to lower motivation.

Method

Participants

Participants in the study were 115 African American youth who completed study measures in Grade 8 and Grade 11. Data for this paper were drawn from a larger longitudinal project examining the development of achievement-related beliefs in adolescents. The original sample at Time 1 consisted of 357 participants (165 boys and 192 girls) from two school districts (one urban and one rural) in the southeastern United States. For the second wave of data collection, youth from the rural school district were targeted because of difficulties in obtaining approval to conduct research in the urban district. Some Time 1 participants were not recruited at Time 2 because they were not African American (n = 108). The sample was further reduced because Time 1 data were collected in 2 waves, and therefore some youth were already in 12^{th} grade during the year that Time 2 data were collected; only youth who were in Grade 11 were recruited at Time 2. Within the rural district, approximately 91% of eligible students returned their consent forms at Time 2, and most of them (95%) agreed to participate. Of those who agreed to participate, 3 did not complete the survey.

As mentioned above, youth from the rural school district were targeted at Time 2, but because of concerns about sample size, selective recruitment was done with families in the urban school district. Current mailing addresses were available for 45 families from the urban district. These families were mailed consent forms. Seventeen families responded positively to the mailing, and 15 of them participated.

Thus, the final sample was 115 African American adolescents (49 boys and 66 girls), 100 of whom were from the three high schools located within the rural school district that sponsored the project. These youth participated in the study when they were in eighth grade, and again in eleventh grade. African Americans comprised 50.1% of the rural county's population. In the three high schools in the district, 62% to 73% of students were African

American. The 15 participants from the urban school district were enrolled in three high schools in which the percentage of African American students ranged from 40% to 88%. Mean age of the students was 13.8 years (*SD* = 0.67) at Time 1 (i.e., Grade 8) and 17.1 years (*SD* = 0.51) at Time 2.

Parent income and education data were available for 80% of the sample. Among families with complete data, approximately 50% of parents reported an annual income of less than $30,000, 29% reported an income between $30,000 and $59,000, and 20% reported an annual income of $60,000 or more. Reported parental education was as follows: 6% completed some high school; 20% were high school graduates; 46% attended some college; 21% had completed a 2-year or 4-year college degree; and 4% had a post-graduate degree.

Comparisons between the current study participants and the excluded African American students revealed that the excluded participants had higher household income and lower failure ability scores in English and writing, $F(1, 183) = 4.51$ and $F(1, 245) = 6.51$, respectively, p's < .05. The two groups did not differ in parental education, the remaining Grade 8 attributions, or Grade 8 classroom engagement, all F's < 2.0. Students from the urban schools did not differ from rural students on any attribution measures or classroom engagement at either time point, all F's < 2.0.

Procedure

At Time 1, participants were recruited by distributing letters (i.e., informed parental consent documents approved by the local ethics review board) to eighth grade students at the middle schools within each school district. The letter contained information about the study and an invitation for the parent or guardian and the youth to participate, along with a pre-paid, return-addressed envelope. Reminder telephone calls and repeat school visits were used to increase the response rate. Of the families who responded, 97% agreed to participate.

The students completed self-report questionnaires in small groups at their school in a single session. Trained undergraduate and graduate research assistants were available to answer questions. At the end of the session, the research assistant thanked the students and gave each a small incentive. Written parental-informed consent was also obtained at Time 2. The procedures used to administer the surveys were similar at the two time points. For their Time 2 participation, students were given the opportunity to travel to a nearby state university where they took a tour, met with admissions representatives, and were entertained by various student performing groups.

Grade 11 classroom engagement ratings were provided by mathematics teachers for 44 students and by English teachers for 72 students. After students completed surveys, teachers were given surveys to complete at a time that was convenient for them; the surveys were returned by mail. Electronic mail and telephone reminder calls were used to increase the response rate. Teachers received monetary incentives based on the number of surveys they completed. Students' course grades were obtained from school records at the end of the academic year. Data were collected in 2004–2005 (Time 1) and 2007–2008 (Time 2).

Measures

Causal Attributions—Attributions were assessed in both eighth and eleventh grade with 24 items. Students were asked to rate the reasons underlying their success and failure in four domains: math, science, writing, and English. Each item had two attribution possibilities (success or failure due to effort and ability), and students rated the importance on a 4-point Likert scale of each of the two in explaining their success or failure. Sample items are: "When I do well in math, it is because I am really good at math" and "When I get a poor

grade in science, it is because I didn't work hard enough." English and writing items were combined to create a verbal domain, which is referred to below as "English."

Classroom Engagement—Teacher ratings of students' classroom engagement were obtained using 15 items that assessed classroom engagement and re-engagement after failure. On a 4-point Likert scale, students' Grade 11 English and mathematics teachers rated the extent to which each statement was true (e.g., "If this student can't get a problem right the first time, s/he just keeps trying" and "This student works hard when we start something new in class"). Scale reliabilities were $\alpha = 0.97$ for English teachers and 0.96 for mathematics teachers.

Achievement—Students' end of the year grades for math, English, and science were obtained from school records at both time points. Grades were on a 4-point scale, where *4* = "A," *3* = "B," *2* = "C," *1* = "D," and zero corresponded to "F."

Results

Overview and Preliminary Analyses

The first three study hypotheses were addressed with a repeated-measures analysis of covariance (ANCOVA) that enabled us to analyze developmental, gender, and domain differences in adolescents' academic attributions. Gender (girl, boy) was entered as a between-subjects variable, and Time (8^{th} grade, 11^{th} grade), Attribution (effort, ability), Outcome (success, failure) and Domain (math, English, science) were entered as within-subjects variables, resulting in a 2(Gender) × 2(Time) × 2(Attribution) × 2(Outcome) × 3(Domain) repeated-measures ANCOVA design. The average of students' end-of-year grades in math, English, and science from eighth grade was added as a covariate. Means and standard deviations of Grade 8 and Grade 11 attributions appear in Table 1. Estimated marginal means, which may be different from the arithmetic means, were used to interpret the ANOVA results. Group comparisons were based on 95% confidence intervals.

We used hierarchical regression analyses to address Hypothesis 4, analyzing the relationship between adolescents' Grade 8 attributions and teacher ratings of their Grade 11 classroom engagement. This relation was examined while controlling for Grade 8 achievement within academic domain. One analysis predicted Grade 11 math engagement, and a second predicted Grade 11 English engagement. Ratings were not obtained from science teachers.

Because students' course grades were used as a covariate in the analyses, preliminary analyses were conducted to examine possible gender and domain differences in students' achievement levels and changes in domain-specific achievement across the three years of the study. Course information was available for 80% ($n = 92$) of the sample. Of those youth, 40% ($n = 37$) were not enrolled in any Honors or AP courses in Grade 11. Of those who took Honors/AP courses in Grade 11, 15% ($n = 14$) were enrolled in one Honors or AP class, with nine students enrolled in Honors/AP English, two enrolled in Honors or AP math, and three enrolled in an Honors or AP science course. Sixteen percent ($n = 15$) were enrolled in Honors or AP courses in two of the three academic domains, and 28% ($n = 26$) took advanced coursework in all three domains. Grade 8 course information was not available.

A 2(Gender) × 2(Time) × 3(Domain) ANOVA on school grades (i.e., end-of-year math, science, and English grades) showed significant main effects of Time and Domain, $F(1, 74) = 6.87$, $p < .01$ and $F(1, 148) = 4.46$, $p < .05$, respectively. These main effects were qualified by a significant Time x Domain interaction, $F(1, 148) = 11.66$, $p < .001$. In Grade 8, grades for math ($M = 3.42$), English ($M = 3.15$), and science ($M = 3.31$) were not significantly different from one another; however, in Grade 11, English and science grades (*M's* = 3.13

and 3.34) were both higher than math grades (M = 2.74), d = .39 and .61, respectively. Neither the main effect of gender nor any interactions involving gender was significant in these analyses.

Additional preliminary analyses were conducted to examine relations between effort and ability attributions within each domain at each time point. These analyses showed different patterns for the three academic domains and at the two grade levels. In Grade 8, students' reports of the importance of ability and effort were moderately correlated regarding English success, science success, and math failure, $r(113)$ = .44, .34, and .34, respectively, all p's < .01. In addition, students' failure ability and failure effort attributions were weakly correlated for science failures, $r(113)$ = .22, p < .05. Ability and effort attributions were unrelated in Grade 8 when students explained English failures and math successes, r's < .10; p's > .10. In Grade 11, ability and effort attributions were positively related when students explained their English successes and their science failures, $r(113)$ = .40 and .28, respectively, p's < .01. Grade 11 ability and effort attributions were unrelated when students explained their math and science successes and their English and math failures, r's < .10; p's > .10. These results illustrated both the domain-specificity of attributions and the fact that adolescents clearly distinguish between ability and effort in explaining academic outcomes.

Developmental, Domain, and Gender Differences in Adolescents' Attributions

In the 2(Gender) × 2(Time) × 2(Attribution) × 2 (Outcome) × 3(Domain) repeated-measures ANCOVA, the main effect of Attribution was significant and was qualified by a significant Attribution x Gender interaction, $F(1, 110)$ = 22.01 and 16.97, p's < .001. Girls attributed successes and failures to effort more than boys, while boys attributed outcomes to ability more than girls, d = .21 and .18, respectively. The Outcome x Domain, Outcome x Domain x Gender, Time x Outcome x Gender, and Time x Domain x Gender interactions were also significant, $F(2, 110)$ = 4.04, $F(2, 110)$ = 3.04, $F(1, 110)$ = 7.11, and $F(2, 110)$ = 4.18, respectively, all p's < .05. These lower-order interactions were all qualified by significant Time x Attribution x Outcome x Domain and Gender x Attribution x Outcome x Domain interactions, $F(2, 109)$ = 5.12 and 4.58, respectively, p's < .01. To interpret these interactions, we first discuss change over time in domain-specific attributions and then discuss gender differences for each attribution. The results are summarized separately for success attributions and failure attributions.

Change in Attributions from Middle School to High School—No change in English attributions was hypothesized, but students were expected to have less adaptive ability attributions for math and science in Grade 11 than in Grade 8. The Time x Attribution x Outcome x Domain interaction partially supported this hypothesis, $F(2, 109)$ = 5.12, p < .01. Math success ability attributions decreased, and math failure ability attributions increased across the three years (see Figures 1 and 2), d = .35. Ability attributions for science and English did not differ across the two time points. Success effort attributions did not change over time, but failure effort attributions increased for math and English, d = .20 and .38, respectively. In addition, some Gender effects emerged, as reported below.

Domain and Gender Differences in Success Attributions—As stated in Hypothesis 2, we expected that boys would be more likely than girls to attribute math and science success to ability, and girls would be more likely than boys to attribute English success to ability. We also expected girls to endorse ability for English success more than for math and science success, whereas boys would endorse ability for math success more than English success. Figure 3 displays boys' and girls' success attributions averaged across Grades 8 and 11. The Gender x Attribution x Outcome x Domain interaction provided partial support for Hypothesis 2, as boys were more likely than girls to attribute math success to ability, F(2,

220) = 6.25, $p < .01$, $d = .54$. However, attributions of English and science success to ability did not differ by gender. In addition, girls were more likely than boys to attribute their math success to effort, $d = .28$, and success effort attributions for science and English did not differ by gender.

Examination of the same interaction within gender yielded the following results: As predicted, girls reported stronger success ability attributions in English than in math and science, $d = .35$, with science success least likely to be attributed to ability, $d = .35$. Also consistent with predictions, boys attributed math success to ability more than English success, $d = .39$. Both boys and girls had stronger effort attributions for science success than for English, $d = .38$, and math success, $d = 1.14$. When explaining math success, girls endorsed ability and effort equally, whereas boys endorsed ability more than effort, $d = .81$. Both boys and girls endorsed effort more than ability when explaining English and science success, $d = .51$ and 1.00, respectively.

Domain and Gender Differences in Failure Attributions—For students' failure attributions, gender differences were expected within each domain, such that girls would be more likely than boys to attribute math and science failure to lack of ability, and boys would be more likely than girls to attribute English failure to lack of ability. We also hypothesized that girls would be more likely to attribute math failures to lack of ability than English and science failures, and boys would endorse lack of ability for English failure more than for math and science failure. Failure attributions aggregated across grade are portrayed in Figure 4. Consistent with Hypothesis 3, boys were more likely than girls to attribute English failure to lack of ability, $d = .32$. However, contrary to predictions, failure ability attributions for math did not differ by gender, and boys were more likely than girls to attribute science failure to lack of ability, $d = .27$. Girls were more likely than boys to attribute science failure to lack of effort, $d = .33$; failure effort attributions for math and English did not differ by gender.

A comparison of these same means within gender revealed that boys were less likely to attribute math failure to a lack of ability than science and English failures, $d = .45$. Girls' failure ability scores and boys' failure effort scores did not differ across domain. Girls attributed failure to lack of effort in science and math more than in English, $d = .41$.

To broadly summarize these results, as predicted, gender differences in attributions were consistent with traditional gender stereotypes. Compared to girls, boys were more likely to attribute math success to ability and to attribute English failures to lack of ability. Girls were more likely than boys to attribute their math success to effort. Girls used ability to explain English success more than in explaining math and science success, whereas boys showed the reverse pattern for English and math. Some of the anticipated effects did not emerge: No gender differences were found in success ability attributions in English or science, or in failure ability attributions for math. Gender differences in attributions did not increase across time. As predicted in Hypothesis 1, both boys and girls were more likely in Grade 11 than in Grade 8 to attribute math failure to lack of ability and less likely to attribute math success to ability, whereas ability attributions for English did not change. Contrary to predictions, ability attributions in science did not change across the three years.

Attributions and Classroom Engagement

As stated above, we used hierarchical regression analyses to examine the relations between attributions and teacher ratings of students' classroom engagement in math and English. Grade 8 end-of-grade domain-specific achievement scores were entered in Step 1 as a control variable (i.e., Grade 8 math achievement was controlled in the equation predicting Grade 11 math engagement, and Grade 8 language arts achievement was controlled in the

analysis predicting Grade 11 English engagement). Grade 8 success ability for math, failure ability for math, success ability for English, and failure ability for English attributions were entered into each equation as the predictor variables. We hypothesized that Grade 8 math attributions would predict Grade 11 math engagement, but not English engagement, and that Grade 8 English attributions would predict Grade 11 English engagement but not math engagement.

The results partially supported Hypothesis 4 (see Table 2). The regression analysis predicting Grade 11 mathematics engagement was significant, $F(5, 38) = 2.70$, $p < .05$. Students' attributions of math failures to lack of ability in Grade 8 were negatively related to Grade 11 engagement as rated by their math teachers, $\beta = -.47$, $p < .01$. Grade 8 math success ability, English success ability, and English failure ability attributions were not related to Grade 11 math engagement. The equation predicting Grade 11 English engagement was non-significant. Because we were also interested in the possible influence of effort attributions on subsequent engagement, regression analyses were also conducted using Grade 8 success and failure effort attributions to predict Grade 11 math and English engagement. These equations were non-significant, as were all bivariate correlations between Grade 8 effort attributions and Grade 11 classroom engagement.

Discussion

The purposes of the present study were to test a central assumption of attribution theory (i.e., that causal attributions about achievement outcomes are related to subsequent motivation) and to use attribution theory as a framework to examine gender differences in the motivational beliefs of African American adolescents. Important contributions of the study are information about the changes in attributions over time, the concordance between attributions and societal gendered views, and the relation between attributions and youths' classroom engagement. Few studies have examined this relation longitudinally, and none had focused on African Americans during the high school years. Moreover, an additional contribution of the study is that it provides normative data about rural African American youth, who are under-represented in the research literature (Brody, Murry, Kim, & Brown, 2002).

We found that attributions for math successes and failures became more negative for both boys and girls across the high school years, and early negative attributions about math predicted lower math engagement three years later. The study also illustrated the importance of examining gender differences in the academic motivation of African American youth. Traditional gender stereotypes were reflected in youths' attributions about the reasons underlying their academic successes and failures: Boys were more likely than girls to attribute math successes to ability and to attribute English failures to low ability. Girls were more likely to attribute English successes to ability than math or science successes, and boys were less likely to endorse lack of ability in explaining math failures than English or science failures. The results show the importance of assessing attributions within academic domains, link attributions to stereotypes as posited by Reyna (2000), and also point to the importance of using an intersectional approach (i.e., examining gender differences) when studying achievement beliefs in Black youth.

Changes in Motivation across the High School Years

Prior research has shown declines in motivation across the high school years, particularly in the domain of math (Chouinard & Roy, 2008; Ma & Cartwright, 2003). Results of the current study corroborated and extended this earlier research by showing that in this African American sample, students were more likely to attribute math failures to lack of ability and were less likely to attribute math successes to ability in late adolescence than in early

adolescence. These attributions were undoubtedly grounded in students' experiences of course difficulty: Average math course grades were lower than English and science grades in Grade 11, but not in Grade 8. Contrary to our study hypotheses, science attributions did not change over the course of the study. The change in causal attributions about math and not about English and science is consistent with previous research showing that students perceive mathematics as a difficult subject that becomes more difficult throughout high school (Stodolsky, 1985). Thus, students may experience more motivational problems in mathematics compared to other subjects, and doubts about math competence appear to be particularly pronounced among girls.

Although the increasing negativity in math attributions across the three years of the study occurred for both boys and girls, it is noteworthy that gender differences in math attributions were found at both time points. That is, in both Grade 8 and Grade 11, boys were more likely than girls to attribute math success to ability, and were less likely to attribute math failure to lack of ability. These results indicate that even before high school entry, girls perceive themselves as less competent in mathematics than boys.

Gender Differences in Attributions for Math, English, and Science

Persistent gender stereotypes in the United States present boys as more competent than girls in mathematics and science, whereas girls are favored in verbal domains (Kiefer & Shih, 2006; Kurtz-Costes et al., 2008). Only limited research has explored whether these gender stereotypes are evident in the achievement-related beliefs of African American youth. Most research examining gender differences among African American adolescents has focused on domain-general achievement motivation and has shown that African American boys tend to fare worse than African American girls (i.e., Graham et al., 1998; Saunders et al., 2004).

The current study provides evidence that gender stereotypes are helpful in understanding the achievement motivation of African American adolescents. As would be expected from traditional academic gender stereotypes, boys in the current study were more likely than girls to endorse ability when explaining math success and to attribute English failure to lack of ability. Moreover, girls endorsed ability most strongly when explaining successes in English, whereas boys endorsed ability most strongly and lack of ability the least when explaining their math successes and failures, respectively. Contrary to our hypotheses, there were no gender differences in science attributions, indicating the value of considering STEM domains separately. As has been noted elsewhere (e.g., Kurtz-Costes et al., 2008), gender stereotypes that discourage young women from pursuing careers in STEM areas also discourage young men from domains where verbal skills are important for success. Despite significant efforts to improve STEM outcomes for girls, few interventions have been aimed at literacy engagement for boys.

These gender differences in attributions have implications for career choices. African Americans are under-represented compared to Whites in engineering and the physical sciences, and Black women are particularly unlikely to pursue careers in these domains (NSF, 2009). Not only are career choices restricted because of traditional gender stereotypes, but women's professional success is further hampered by wider societal beliefs about the personality traits of men and women. Given equal performance evaluations of men and women, causal attributions made about long term successes differ by gender (Ruble, Cohen, & Ruble, 2001). Namely, successes of men tend to be linked to personal, stable attributes, whereas successes of women are more likely to be attributed to less stable factors such as effort or luck (Ruble et al., 2001). Taken together, these results underscore the need to consider gender as a social construct in research with African Americans rather than focusing exclusively on race as a social identity.

Attributions and Classroom Engagement

Consistent with attribution theory, we expected that attributions would be related to subsequent classroom engagement. Our attempt to substantiate this relationship provided a rigorous test of theory. Three years elapsed between students' reports of their causal attributions and teachers' subsequent reports of students' engagement. Moreover, the reduced sample size due to the limited availability of teacher data restricted the statistical power needed to detect significant relations. In spite of these factors, our data supported the hypothesized link within the domain of math: Eighth graders who attributed math failures to low ability had lower math engagement in Grade 11 as reported by their teachers. This effect was significant when previous math achievement was controlled, indicating that students' math attributions are influential motivational beliefs for students regardless of their achievement level. As we hypothesized, attributions acted in a domain-specific manner. That is, students' English attributions were unrelated to their subsequent math engagement, and early math attributions were unrelated to subsequent English engagement.

These results have implications for growing gender gaps across academic domains as youth move into middle and late adolescence. Although we were not able to consider the relation between early attributions and later engagement separately for boys and girls, we can conclude that the gendered patterns of attributions put girls particularly at risk for low math engagement and boys at risk for low engagement in verbal domains. In both grades, boys had more positive math attributions and more negative English attributions than girls. Gender differences in attributions and engagement are likely to be accompanied by gender differences in the value ascribed to specific domains. Values, in turn, are likely to lead to gender differences in high school course selection and career choices (Durik, Vida, & Eccles, 2006). Our results show that stereotypes—which influence performance in "stereotype threat" paradigms when knowledge about a stereotype is activated (Schmader, Johns, & Forbes, 2008)—also shape academic outcomes by influencing achievement-related beliefs. Thus, it is likely that in schools where a large percentage of students are White, the academic performance of African American students is influenced both by subtle and sometimes blatant reminders of race stereotypes (which then hamper performance as shown in stereotype threat literature) and by the influences of race and gender stereotypes on achievement-related beliefs such as attributions.

Although failure was attributed to lack of effort more strongly than to lack of ability by both genders for all three academic domains in the current study, effort attributions were unrelated to subsequent engagement. These results are surprising, as folk wisdom in the United States espouses the value of effort: Our culture esteems hard work. Nonetheless, within the academic setting, a student who deploys a great deal of effort may be perceived as less able than a student who projects the image of successful performance with little effort. Although attribution retraining programs have improved students' performance by teaching them to attribute their failures to lack of effort (e.g., Haynes et al., 2008), failure effort attributions do not necessarily predict future effort. In fact, a student who is disengaged academically and who rightly attributes his or her failures to lack of effort may choose to continue to be disengaged. Alternatively, our failure to detect a relation between students' endorsement of effort and their subsequent engagement may have simply been due to low statistical power.

Suggestions for Future Research

A goal of the study was to examine how attributions influence classroom engagement; however, the relatively small number of teacher reports available reduced the statistical power to detect significant relations. A larger sample of student participants would also have strengthened the study: Although most of our hypotheses were confirmed, statistical power

was insufficient to use causal modeling to analyze relations among variables or to examine these relations separately for boys and girls. Longitudinal research with larger samples would also permit a test of bidirectional relations between attributions and classroom engagement. Highly engaged youth have more opportunities than less-engaged students to form positive attributions; belief in the causal utility of one's ability and effort, in turn, promotes subsequent achievement striving.

Research should also examine how these processes vary across contexts. Students in our sample attended schools in which a majority of students were Black. It is possible that the gender differences found in the current study are more likely to emerge in majority-Black schools than among African American adolescents who attend schools that are more racially diverse. Gender may emerge as a more dominant social identity in a majority African American setting.

A significant contribution of this study is that it focused on a normative rural population who were average and above-average students. The majority of research on African American adolescents has been conducted with urban, low-income youth. African American adolescents who live in rural areas may be at increased risk for negative school outcomes due to the restricted access to resources associated with geographical isolation. Alternatively, they may be in more supportive environments than urban youth, who face risk factors such as high crime rates, exposure to violence, and access to drugs. A few studies have addressed factors that influence positive academic outcomes in African American rural youth (e.g., Brody & Flor, 1998; Brody et al., 2002; Kerpelman & Mosher, 2004).

Future research should directly investigate causal relations between stereotype endorsement and attribution formation. A student who believes his or her in-group fares worse than other groups in a certain domain may be more likely to form maladaptive attributions for that domain. It would also be of interest to investigate how ability attributions are interwoven with perceptions of task difficulty. Ability and effort attributions were positively correlated when students explained English successes, but not when students explained math successes. Because our high school participants viewed math as more difficult than science or English, the correlation results seem to imply that when students feel competent in a domain, they are more likely to attribute success to a combination of ability and effort. In contrast, in the domain of math, where students felt less competent, ability and effort attributions were unrelated.

Another important arena for future research is an examination of external attributions such as teacher preference and access to resources. Mooney and Thornton (1999) found in a sample of seventh graders that White students were more likely to attribute mathematics success to ability than Black students, who were more likely than Whites to attribute math success to rapport with their teacher. In her comprehensive 1994 review, Graham concluded that whereas research with children has provided some evidence that Whites may have a stronger internal locus than Blacks, external beliefs may be less maladaptive among African Americans than among Whites. In the years since Graham's review, researchers have begun to examine not only why external beliefs may *not* be maladaptive, but might actually be protective among Black youth. In particular, theorists argue that attributing failure to external causes such as teacher bias, racially-biased tests, and systemic discrimination protects the self-views of Black youth when they encounter academic failure (Major, Spencer, Schmader, Wolfe, & Crocker, 1998; Schmader, Major, & Gramzow, 2001).

The results of the current study illustrate the importance of attributions, particularly attributions to ability, in shaping the classroom engagement of adolescents. The belief that failure is due to low ability—which varied by gender and by academic domain—may lead

students to be less persistent, as they may believe that their low ability will limit the positive effects of their effort. Given the influence of attributions on later classroom engagement, measures should be taken to modify students' negative beliefs about their academic abilities. For example, interventions that encourage minority students to view intelligence as malleable and to attribute failure to a novel, unfamiliar setting have increased the performance of those students (Aronson, Fried, & Good, 2002; Good, Aronson, & Inzlicht, 2003). Attribution re-training might lead not only to higher overall achievement among African American youth, but might also reduce the racial and gender disparities noted in higher education and career choices.

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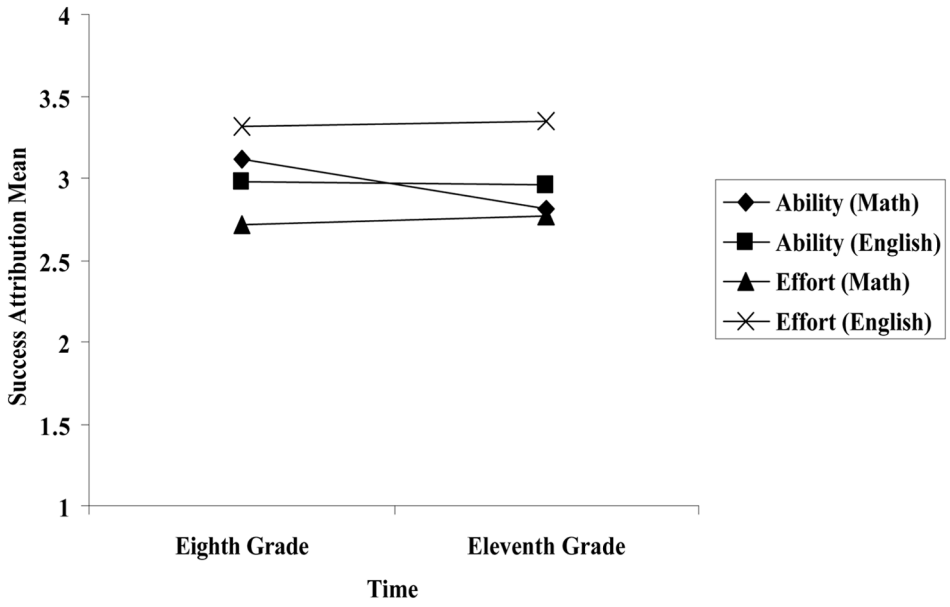

Figure 1.
Changes in Causal Attributions for English and Mathematics Success from Grade 8 to Grade 11 (*N* = 115).

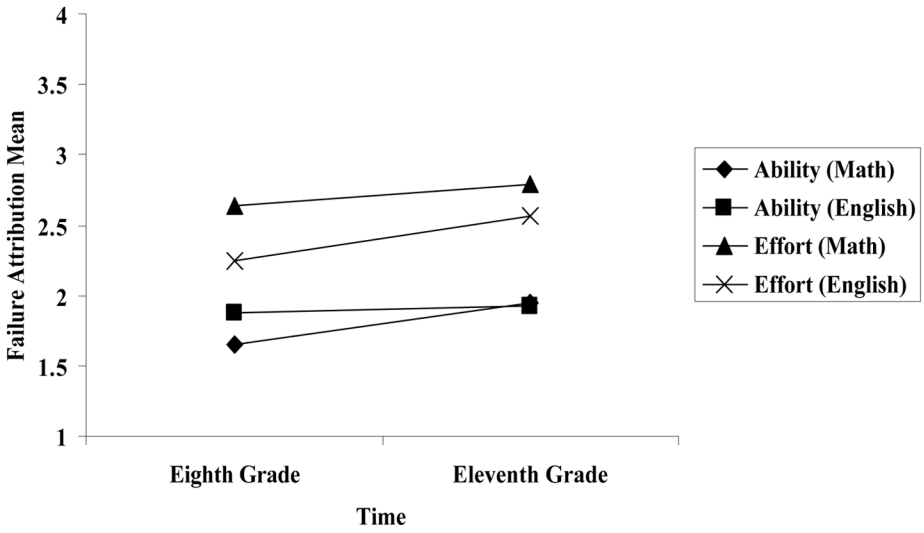

Figure 2.
Changes in Causal Attributions for English and Mathematics Success from Grade 8 to Grade 11 (*N* = 115).

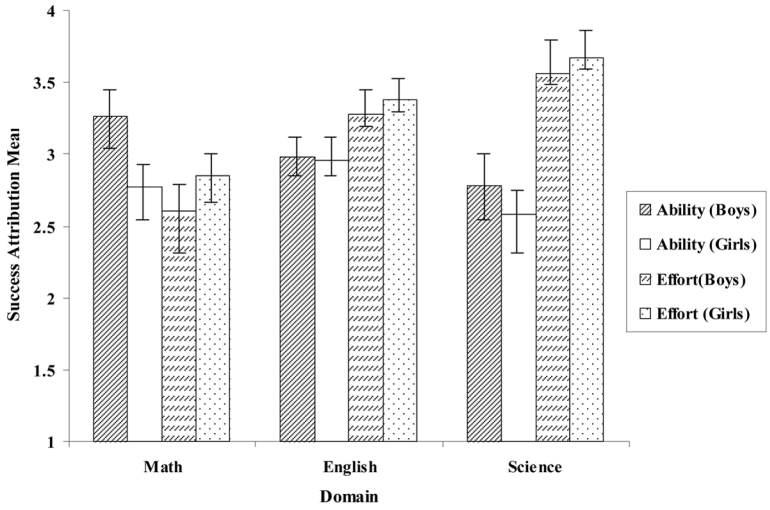

Figure 3.
Boys' and Girls' Causal Attributions for Success in English, Mathematics, and Science (*N* = 115; scores averaged across Grade 8 and Grade 11).

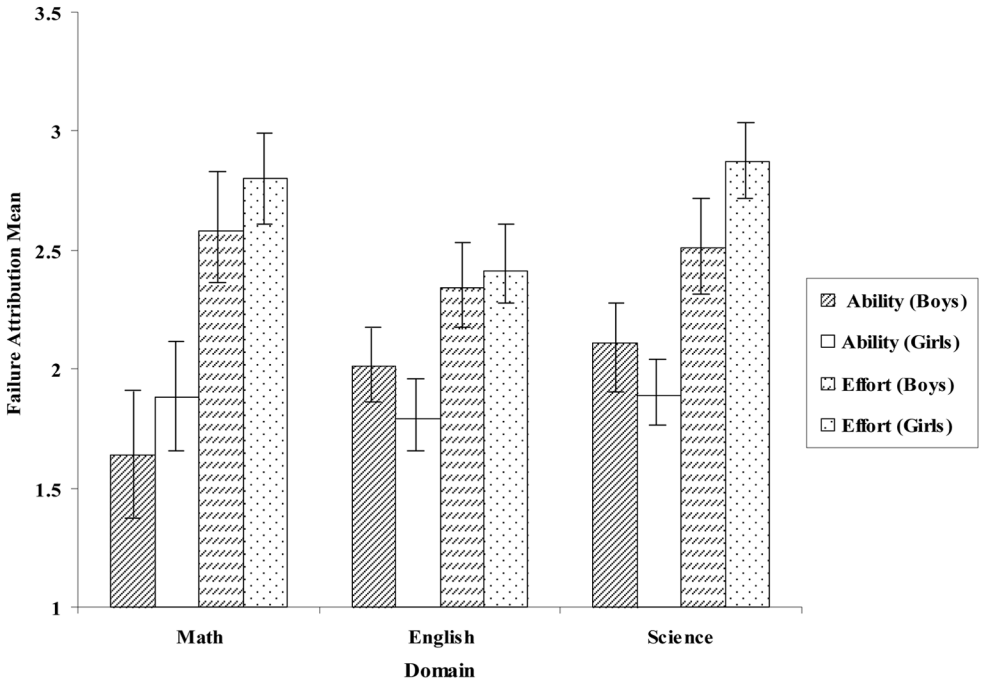

Figure 4.
Boys' and Girls' Causal Attributions for Failure in English, Mathematics, and Science (*N* = 115; scores averaged across Grade 8 and Grade 11).

Table 1

Means and Standard Deviations for Domain-Specific Attributions, by Gender and Grade

	8th Grade		11th Grade	
	Boys	Girls	Boys	Girls
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Mathematics				
Success Ability [a, b]	3.41(.81)	2.91(.91)	3.10(.65)	2.60(1.00)
Failure Ability [a]	1.53(.96)	1.74(1.10)	1.84(.94)	2.05(1.14)
Success Effort [b]	2.65(.83)	2.78(.84)	2.59(.93)	2.91(.95)
Failure Effort [a]	2.39(1.11)	2.82(.99)	2.82(.94)	2.77(1.07)
English/Writing				
Success Ability	3.11(.72)	2.88(.71)	2.86(.72)	3.03(.67)
Failure Ability [b]	2.05(.77)	1.76(.66)	2.01(.81)	1.86(.54)
Success Effort	3.41(.64)	3.26(.75)	3.17(.59)	3.48(.78)
Failure Effort [a]	2.23(.84)	2.26(.90)	2.51(.73)	2.60(.85)
Science				
Success Ability	2.86(.91)	2.36(.95)	2.76(.99)	2.77(.89)
Failure Ability	2.10(.94)	1.88(.96)	2.17(.95)	1.88(.95)
Success Effort	3.55(.77)	3.61(.68)	3.60(.64)	3.71(.55)
Failure Effort [a, b]	2.41(.98)	2.92(.99)	2.67(.88)	2.80(1.04)
	n =49	n =66	n =49	n =66

[a] Scores for boys and girls changed from Grade 8 to Grade 11, $p < .05$.

[b] Collapsed across time, girls differed from boys at $p < 05$.

Table 2

Hierarchical Regression Analysis Predicting 11th Grade Mathematics Engagement (N = 44)

	11th Grade Math Engagement			
Variable (grade)	***β***	***SE*$_{\beta}$**	**B**	***r***
1. Achievement(8)	.18	.004	.01	
2. Achievement(8)	.15	.004	.01	.18
Math Success Ability (8)	−.25	.14	−.22	−.02
Math Failure Ability (8)	−.46	.13	−.37**	−.40**
English Success Ability (8)	−.02	.15	−.02	−.01
English Failure Ability (8)	−.18	.15	−.17	−.24

Note. R^2 = .03 for Step 1; ΔR^2 = .23 for Step 2

** $p < .01$