

Development of Logical Reasoning and the School Performance of African American Adolescents in Relation to Socioeconomic Status, Ethnic Identity, and Self-Esteem

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This study explored the deductive reasoning and school performance of 330 African American adolescents and the relation of reasoning and school performance to socioeconomic status (SES), ethnic identity, and self-esteem. As expected, there was a systematic increase in selection task reasoning performance across adolescence, and high SES students outscored low SES students in reasoning performance and school grades. Ogbu's cultural-ecological theory, which predicts an inverse relationship between cognitive performance and ethnic identity strength, was not supported because better reasoning performance was associated instead with stronger ethnic identity. Steele's stereotype-threat theory, which predicts that there will be an association between global self-esteem and school grades in early adolescent African Americans that subsequently decreases across adolescence, was partially supported. Self-esteem and grades were strongly related in 6th graders, not significantly related in 10th and 12th graders, yet strongly related in college students.

Researchers (Fisher, Jackson, & Villaruel, 1998; Lerner & Galambos, 1998; Steinberg & Morris, 2000) have noted that the empirical literature

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addressing the normative psychological development of American ethnic minority adolescents is very limited, "In fact, the majority of studies published in the leading scientific journals of child and adolescent development have virtually ignored development within non-European, non-middle class children and families" (Fisher et al., 1998, p. 1150). This trend has continued despite the proliferation of theories (Cooper & Denner, 1998) that express the importance of context and culture for developmental processes.

One area of development where there have been few studies of ethnic minority adolescents is the development of reasoning, an important type of thinking that involves inference, the process where propositions known as premises that have been accepted provide the evidence for arriving at and accepting further propositions known as conclusions (Overton, 1994). There are two major types of reasoning processes: inductive and deductive. Inductive reasoning involves an inference process that proceeds from particular to general propositions, where premises provide probable but not certain evidence for conclusions. Deductive reasoning involves an inference process that moves from general to particular propositions, where general premises provide absolutely certain evidence for the truth of particular conclusions. The first focus of this study is on the development of deductive reasoning in African American adolescents.

The main line of investigation into deductive reasoning (Cheng & Holyoak, 1985; Cosmides, 1989; Evans, 1996; Overton, 1990) has used versions of the four-card selection task (Wason, 1968), a measure consisting of propositional logic problems that test the individual's ability to deduce correct conclusions from given rules. Investigators using the selection task have found that deductive reasoning competence first develops during early adolescence and that by late adolescence a high level of proficiency in solving deductive reasoning problems is generally achieved (Chapell & Overton, 1998; Foltz, Overton, & Ricco, 1995; Overton, Ward, Noveck, Black, & O'Brien, 1987; Reene & Overton, 1989; Ward & Overton, 1990). These results support cognitive developmental theory (Inhelder & Piaget, 1958), which predicts that both inductive and deductive reasoning develop during and across adolescence.

To date, developmental studies of deductive reasoning have been conducted exclusively with European American adolescents. Three published studies of deductive reasoning ability measured by selection task performance have used samples of ethnic minority adolescents (Bell, Brown, & Bryant, 1993; DeShon, Smith, Chan, & Schmitt, 1998; Smith & Drumming, 1989). However, these were nondevelopmental studies because they

involved only African American college students. To further test the main prediction from cognitive developmental theory that deductive reasoning competence develops during and across adolescence, this study explored the development of deductive reasoning in African American 6th, 10th, and 12th graders and college students. It was hypothesized, consistent with the pattern of deductive reasoning performance found in European Americans, that there would be a clear developmental progression of deductive reasoning performance across adolescence in African Americans.

The first purpose of this study was to explore the development of deductive reasoning in African American adolescents to diversify and broaden the scope of cognitive developmental research. According to current developmental theory, however, "To understand individual growth and development, the changing relations among biological, psychological, and social contextual levels that comprise the process of developmental change must be examined concurrently" (Fisher et al., 1998, p. 1153). Consistent with this view, studies have shown that there are significant individual differences in the expression of deductive reasoning competence and that deductive reasoning performance is influenced by contextual factors such as familiarity of problem content (Overton et al., 1987) and parenting styles and test anxiety (Chapell & Overton, 1998). Therefore, the second purpose of this study was to explore two factors that may significantly influence the cognitive performance of African American adolescents: socioeconomic status (SES) and ethnic identity.

Researchers have noted that studies that do include participants other than middle-class European Americans often confound race and social class effects by comparing low SES African Americans with higher SES European Americans (Graham, 1992). For instance, in the study cited above, DeShon et al. (1998) compared the deductive reasoning performance of European American college students to that of African Americans whose average family income was lower. This SES inequality also has typified studies using only African American participants, as Graham (1992) pointed out, "Furthermore, with the growing gap between the affluent and the impoverished within the population of American Blacks, it is just as important that race-homogeneous studies not err in the direction of ignoring socioeconomic distinctions between African American subjects" (p. 634). Given the consistent finding that high SES individuals outscore low SES individuals on cognitive tests (Neisser et al., 1996; Suzuki & Valencia, 1997; Williams & Ceci, 1997), this study explored the hypothesis that high SES African American students would have better deductive reasoning performance than low SES students.

OGBU'S CULTURAL-ECOLOGICAL THEORY

African American adolescents generally perform more poorly on cognitive tests and receive lower grades in school than European Americans (Jencks & Phillips, 1998; Neisser et al., 1996; Steinberg, Dornbusch, & Brown, 1992; Williams & Ceci, 1997). This performance gap has most frequently been attributed to ethnic differences in genetic factors related to intelligence, ineffectual parenting practices, and aspects of the linguistic and cognitive styles of African American culture considered disadvantageous to cognitive test performance (Ogbu, 1986, 1993). Ogbu (1986) has long contended that all of these views suffer from ethnocentric bias, and Ogbu's alternative cultural-ecological model maintains that the missing factor in the African American cognitive performance equation is their lower caste-like status as an involuntary minority group created by and historically subordinated to a dominant European American majority.

Ogbu (1986) maintains that African Americans develop and possess the same cognitive capacities as European Americans, including the capacity to "remember, generalize, form concepts, operate with abstractions, and reason logically" (p. 34). However, Ogbu distinguishes the availability of these cognitive capacities from their application, "Cognitive competencies or cognitive skills, on the other hand, arise from the different ways different populations use the common human cognitive capacities to solve specific cognitive problems they face in their particular environments and in their historical experiences" (Ogbu, 1987, p. 157).

In the case of African Americans, Ogbu (1986, 1987, 1988, 1993) maintains that because of their long history of inferior education and exclusion from middle-class, white-collar jobs that require advanced cognitive skills, African Americans have systematically been deterred from expressing their universal cognitive capacities. Rather, as a reaction to centuries of racial discrimination, Ogbu theorizes that many African Americans have become disillusioned about their future job prospects and the actual value of schooling and have developed a disinterested attitude leading to depressed cognitive performance and scholastic underachievement. Fordham and Ogbu (1986) further proposed that African Americans have developed a sense of collective identity that stands in active opposition to that of European Americans. As a result, behaviors related to cognitive performance, such as speaking standard English, taking math and science courses, studying hard and testing well, are seen by African Americans as attempts to "act White," which cross "cultural and cognitive boundaries" and betray the African American group identity.

Some high-achieving African American students have been found to gain success in school at the cost of forsaking their ethnic identity and becoming "raceless" (Fordham, 1988), but pressure to "stay Black" is so intensely felt that many African American adolescents are thought to prefer to maintain their ethnic identities by consciously or unconsciously testing poorly and underachieving.

Studies designed to test Ogbu's theory based on information and data gathered 20 or more years ago (Fordham, 1988, 1996; Fordham & Ogbu, 1986; Mickelson, 1990; Ogbu, 1974) supported the predicted relationships between perceived racial discrimination barriers such as "job ceilings," the maintenance of an oppositional ethnic identity, and depressed African American school performance. Recent studies have provided more mixed results, finding that African American adolescents reported peer support for academic success, no "acting White" stigmatization by peers for doing well in school (Ainsworth-Darnell & Downey, 1998; Cook & Ludwig, 1998; Ogbu & Simons, 1994; Spencer, Noll, Stoltzfus, & Harpalani, 2001), and that high ethnic identity scores were associated instead with increased school engagement and better grades (Taylor, Casten, Flickinger, Roberts, & Fulmore, 1994). The present study adds to the investigation of Ogbu's theory by testing the hypotheses that African American sixth graders through college students with high ethnic identity scores would have lower deductive reasoning performance and grade point averages (GPAs) than those with low ethnic identity scores.

STEELE'S STEREOTYPE THREAT THEORY

A second major theoretical model, the stereotype threat theory of Steele (1992, 1997, 1998, 1999), also has proposed that the cognitive performance of African American adolescents is negatively influenced by a history of racial discrimination and prejudice. Steele and Aronson (1995) state, "Whenever African American students perform an explicitly scholastic or intellectual task, they face the threat of confirming or being judged by a negative societal stereotype—a suspicion—about their group's intellectual ability and competence" (p. 797). According to Steele, stereotype threat is experienced as a negative emotional reaction that can interfere with performance in academic evaluation situations, affecting individuals from groups whose abilities have been negatively stereotyped.

Steele further suggests that faced with the continual threat of being judged by or confirming this negative stereotype of intellectual inferiority, over time,

African American adolescents may gradually come to devalue school performance and underperform. According to this "school disidentification" hypothesis, "If the poor school achievement of ability-stigmatized groups is mediated by disidentification, then it might be expected that among the ability stigmatized, there would be a disassociation between school outcomes and overall self-esteem" (Steele, 1997, p. 623). Thus, African American adolescents chronically subjected to the added stress of stereotype threat in academic evaluation situations may eventually disengage from school and devalue school performance to protect their self-esteem.

Although Ogbu's cultural-ecological theory and Steele's stereotype threat theory both ascribe African American cognitive underperformance to the negative impact of racial prejudice and discrimination, these models offer distinctly different explanations as to how African American students interpret and respond to these negative conditions. Thus, for instance, whereas Ogbu suggests that African American students interpret testing well and performing well in school as "acting White," constituting a threat to their ethnic group identity to be avoided by performing poorly, Steele suggests that the strain of being judged by or confirming the negative stereotype of Black intellectual inferiority in academic evaluation situations threatens the personal identity and self-esteem of African American students, leading them to gradually disidentify with school, resulting in underachievement.

Osborne (1995, 1997) first tested Steele's school disidentification hypothesis using data from the National Education Longitudinal Study and, as predicted, found a pattern of growing disidentification with school performance in African Americans, with the positive correlation between global self-esteem and school GPA in 8th graders decreasing in both male and female 10th graders and becoming nonsignificant in 12th-grade men. In the current cross-sectional study, Steele's school disidentification thesis was explored further by hypothesizing that the correlation between global self-esteem and GPA would decline in African Americans across all of adolescence, from the 6th grade through college.

In summary, the main developmental hypothesis tested in this study was that deductive reasoning performance would increase across adolescence in African Americans. It was also predicted that (a) high SES African American students would have significantly better deductive reasoning performance than low SES students, (b) adolescents with high ethnic identity scores would have significantly lower reasoning scores and GPAs than those with low ethnic identity scores, and (c) the correlation between self-esteem and GPA would decline across adolescence.

METHOD

PARTICIPANTS

A total of 330 African American students participated voluntarily, including 62 6th graders (28 men, 34 women), 66 10th graders (34 men, 32 women), 87 12th graders (32 men, 55 women), and 115 college undergraduates (32 men, 83 women). The middle school and high school participants were drawn from public schools located in a major eastern city. The ethnic composition of the middle school was 99% African American, with 70% of the students described by the school district as low income. The high school was 98% African American, with 80% low income students. The college participants attended a public university in a major eastern city with a total enrollment of 26,000 that was 60% European, 26% African American, 10% Asian, and 3% Hispanic.

This sample was not randomly selected but was a sample of convenience including all students who volunteered to participate. Given that approximately 15% of African American high school students drop out before completing their degrees (National Center for Educational Statistics, 1997), some during the middle school years and some during high school, the issue of how to maintain the comparability of the sample from the 6th grade through college was a problem requiring careful attention. To help strengthen the internal validity of the study, the 6th graders were chosen from a middle school with a high (90%) grade promotion rate. The 10th and 12th graders were drawn from the high school's top college preparatory track, and the 12th graders had all been accepted at a college. However, neither the middle school nor high school used were selective in admissions but were schools whose students performed at city-wide averages on standardized tests ("Report Card on the Schools," 1997), and this balance of selectiveness and nonselectiveness was used to maximize comparability without sacrificing the representativeness of this urban African American sample and the generalizability of this study's findings.

DESIGN AND PROCEDURE

Participants in groups of 10 to 30 were administered a general information measure, including questions about age, sex, and grade in school or year in college, followed by measures of GPA (Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987), SES (Steinberg, Mounds, Lamborn,

& Dornbusch, 1991), Rosenberg's (1979) Self-Esteem Scale, Overton's (1990) version of the selection task, and Phinney's (1992) Multigroup Ethnic Identity Measure.

The administration of all measures was performed by the European American first author during school time in school classrooms. Graham (1992) reviewed studies and concluded that there is no evidence suggesting that European American researchers negatively influence the cognitive performance of African Americans. However, Graham also recommended that in studies such as the current one, which did not involve African American researchers, the possibility of limitations due to unknown, potential researcher-participant effects should be acknowledged.

MEASURES

School GPA

Student GPA was measured using a self-report scale (Dornbusch et al., 1987), consisting of a question asking the participant to select the category describing the usual grades the student gets in school. The categories are as follows: mostly As, about half As and Bs, mostly Bs, about half Bs and half Cs, mostly Cs, about half Cs and half Ds, mostly Ds, and mostly below D. A numerical scale was then related to these responses, with 4.0 representing the "mostly As category," 3.5 representing the "about half As and half Bs" category, and so forth. In previous studies with large multi-ethnic samples, Dornbusch et al. (1987) and Steinberg, Lamborn, Darling, Mounts, and Dornbusch (1994) reported high correlations of $r = .76$ and $r = .80$, respectively, between student GPA measured with the self-report measure and actual student grades taken from school records.

SES

SES was operationalized as the mean educational level of the parents or guardians with whom the participants resided (Steinberg et al., 1991). Parental education has been found to be the most stable component of a family's social class (see Steinberg et al., 1991, for a discussion). This measure asks participants to indicate the highest of eight levels of education completed by each of their parents or guardians, including some grade school, finished grade school, some high school, finished high school, some college or 2-year degree, 4-year college degree, some school beyond college, and professional or graduate school. Each level on this scale is given 1 point, yielding a total

score ranging from 1 to 8 points. Scores for both parents are summed and averaged to yield the participant's SES score. Two social class categories were created, with those whose parental education level was below the sample median classified as low SES and those above the median classified as high SES.

Self-Esteem

Global self-esteem was assessed using Rosenberg's (1979) 10-item Self-Esteem Scale ($\alpha = .82$). Rosenberg's measure is considered the most psychometrically sound measure of global self-esteem and has been used extensively with African American adolescents (Gray-Little & Hafdahl, 2000). Participants respond to each of 10 statements on a 4-point Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (4). This scale contains both positively and negatively worded items regarding the respondent's opinion of his or her self-worth. The total self-esteem score is obtained by reversing negatively worded items, summing all item scores, and obtaining the mean. Scores range from a maximum of 4 (indicating high self-esteem) to a low of 1 (indicating low self-esteem).

Selection Task

The selection task (Overton, 1990) is composed of a series of 10 conditional propositions (see Table 1). Formal deductive understanding of an implication ("If p, then q") requires the recognition that particular instances of the antecedent and consequent clauses of a sentence are either permissible, not permissible, or indeterminate. The selection task requires this recognition and coordination between permissible and impermissible instances; thus, it is a valid measure of deductive reasoning. The validity of this measure is further supported by evidence showing a close relationship between deductive reasoning on Overton's selection task and on other tasks (Foltz et al., 1995).

Selection task test booklets were constructed containing 10 problems presented in the conditional "if p, then q" form, such as, "If a person is drinking beer, then the person must be over 21." In each problem, participants were required to establish the logical conditions under which these rules would be broken. A general solution score, giving partial credit for partial solutions, was the first dependent measure. For each problem, participants received one point for each of the following: choosing "p," choosing "not q," not choosing "not p," and not choosing "q," yielding a total possible score with a range of 0

TABLE 1
Selection Task Conditional Proposition Statements

If a person is swimming in the public pool, then a lifeguard is present. ^a
If a student is watching television, then the student's homework is finished.
If a person is drinking beer, then the person is 21 years of age.
If a person is driving a motor vehicle, then the person must be over 16 years of age.
If a student is caught running in the halls, then the student must be punished.
If a person is retired from work, then the person is over 55 years of age.
If a student strikes a teacher, then the student is suspended.
If a person has a handgun, then the handgun must be registered.
If a drunken driver kills someone, then the driver must be charged with murder.
If a child with AIDS attends school, then the child has the community's approval.
If a girl under 14 years old has an abortion, then she must have her parents' permission.

a. This was a warm-up problem.

to 40 points across the 10 problems. The correct logical response to selection task problems is the selection of the "p" and the "not q" alternatives while not selecting the "not p" or the "q" alternatives. This selection combination, called the complete falsification solution, was used as a second dependent variable. A score of 1 point was given for each problem when this solution is selected and 0 points for any other response, yielding a score range of 0 to 10 points. Finally, the consistency with which participants selected the complete falsification solution across the 10 problems was assessed. As established in prior research (Chapell & Overton, 1998; Overton et al., 1987; Ward & Overton, 1990), a consistency criterion of 6 complete falsification solutions out of 10 problems was used to indicate the attainment of formal deductive reasoning competence.

Ethnic Identity

Phinney's (1992) Multigroup Ethnic Identity Measure (MEIM) is a 14-item questionnaire ($\alpha = .78$) that has consistently demonstrated good reliability in many studies across a wide range of ethnic groups, including African Americans (Phinney, 1992; Phinney, Cantu, & Kurtz, 1997; Phinney & Chavira, 1995; Phinney, Ferguson, & Tate, 1997). The MEIM assesses three aspects of ethnic identity: positive ethnic attitudes and sense of belonging (5 items), ethnic identity achievement based on exploration and commitment (7 items), and ethnic behaviors or practices (2 items). Each item is rated on a 4-point scale from *strongly agree* to *strongly disagree*. Scores range from 4

points (indicating high ethnic identity) to 1 point (indicating low ethnic identity). The total MEIM score is derived by reversing negative items, summing across items, and obtaining the mean. High MEIM scores indicate a strong ethnic identity and low scores indicate a weak ethnic identity. Two categories were created, with participants whose ethnic identity scores were below the sample median classified as low ethnic identity and those above the median classified as high ethnic identity.

RESULTS

Prior to testing hypotheses, descriptive statistics for the main variables were computed for the entire sample and for each grade level (see Tables 2 and 3). In addition, a preliminary analysis via MANOVA examined for gender differences. There were no significant differences on any dependent variable based on gender, $F(6, 305) = .98, p = .96$, and univariate ANOVAs further confirmed that there were no significant differences on any individual variable based on gender.

Development of Logical Reasoning

To test the main cognitive developmental and contextual hypotheses, a 4 (grade) \times 2 (SES) \times 2 (ethnic identity) ANOVA, adjusted for unequal cell sizes, was computed on the general solution scores (see Table 4). Given an a priori alpha level of .05 for all statistical tests, there were significant main effects for grade, $F(3, 304) = 9.01, p < .001$, (effect size $f = .28$); SES, $F(1, 304) = 3.94, p < .05$, ($f = .10$); and ethnic identity, $F(1, 304) = 6.72, p < .05$, ($f = .13$). (According to Cohen [1977], effect sizes of $f = .10$ are considered small, whereas those in the .25 range are moderate.) Scheffé tests showed that, as expected, college students ($p < .001$), 12th graders ($p < .001$), and 10th graders ($p < .05$) had higher reasoning scores than 6th graders. There were no other significances between grade differences. High SES students significantly outscored low SES students, $p < .05$. High ethnic identity students outscored low ethnic identity students, $p < .01$. There were no significant interactions.

To further test these hypotheses, a 4 (grade) \times 2 (SES) \times 2 (ethnic identity) ANOVA was computed on the complete falsification solution scores (see Table 5). There was a significant main effect for grade level, $F(3, 304) = 6.88, p < .001$ ($f = .24$). Scheffé tests showed that, as expected, college students ($p < .001$), 12th graders ($p < .05$), and 10th graders ($p < .05$) had higher reasoning

TABLE 2
Means, Standard Deviations, and Ranges of the Variables

	M	SD	Range	N
Age (years)	17.72	3.70	12-27	330
GPA	2.95	.64	1.5-4.0	314
SES	4.81	1.31	1.0-8.0	322
Self-esteem	3.40	.44	2.3-4.0	314
Ethnic identity	3.27	.48	1.8-4.0	330
General scores	31.10	6.38	16-40	330
Falsifications	4.44	3.80	0-10	330

NOTE: GPA = grade point average, SES = socioeconomic status.

TABLE 3
Means, Standard Deviations,
and Ranges of the Variables by Grade

	Grade							
	6th		10th		12th		College	
	M	SD	M	SD	M	SD	M	SD
Age (years)	12.70	.47	15.40	.77	17.90	.95	21.50	2.60
GPA	2.82	.70	3.04	.89	2.88	.52	3.02	.56
SES	4.62	1.20	4.84	1.30	4.64	1.20	5.01	1.40
Self-esteem	3.01	.38	3.40	.41	3.46	.40	3.62	.40
Ethnic identity	2.99	.46	3.09	.49	3.30	.39	3.48	.45
General scores	27.20	6.00	29.80	6.30	32.20	6.00	33.00	5.80
Falsifications	2.44	3.10	4.20	3.50	4.64	3.90	5.57	3.80

NOTE: GPA = grade point average, SES = socioeconomic status. There were no significant between-grade differences in GPA, $F(3, 310) = 1.17, p = .32$, or SES, $F(3, 318) = 2.09, p = .11$. The modal parental SES level was the completion of high school.

scores than 6th graders. There were no other significances between grade differences and no significant interactions.

The final analyses of reasoning performance compared the consistency with which participants at each grade level, SES level, and ethnic identity level gave the logically correct complete falsification solution. Based on the consistency criterion of 6 of 10 complete falsifications, 18% of 6th graders, 39% of 10th graders, 45% of 12th graders, and 56% of college students were

TABLE 4
General Solution Scores by Grade,
SES, and Ethnic Identity Level

	<i>Grade</i>							
	<i>6th</i>		<i>10th</i>		<i>12th</i>		<i>College</i>	
	M	SD	M	SD	M	SD	M	SD
Grade	27.2	6.0	29.8	6.3	32.2	6.0	33.0	5.8
SES								
Low	27.2	5.7	28.7	7.4	31.4	5.6	32.8	5.6
High	27.1	6.7	31.1	5.8	33.2	6.4	33.3	6.0
Ethnic identity								
Low	25.6	5.6	28.7	6.2	32.5	6.1	31.5	6.5
High	29.2	6.1	31.8	6.8	31.5	5.9	33.2	5.5

NOTE: SES = socioeconomic status.

TABLE 5
Complete Falsifications by Grade, SES, and Ethnic Identity Level

	<i>Grade</i>							
	<i>6th</i>		<i>10th</i>		<i>12th</i>		<i>College</i>	
	M	SD	M	SD	M	SD	M	SD
Grade	2.4	3.1	4.2	3.5	4.6	3.9	5.6	3.8
SES								
Low	2.1	3.0	4.0	3.5	4.4	3.7	5.5	3.6
High	3.0	3.3	4.3	3.6	5.3	4.1	5.6	3.9
Ethnic identity								
Low	1.9	2.7	3.5	3.2	4.7	4.1	4.6	4.1
High	3.0	3.5	4.6	3.8	4.9	3.8	5.6	3.6

NOTE: SES = socioeconomic status.

rated as formal deductive reasoners. More college students ($z = 4.88, p < .001$), 12th graders ($z = 3.44, p < .001$), and 10th graders ($z = 2.62, p < .01$) were formal deductive reasoners than were 6th graders. There were also more formal deductive reasoners among college students than 10th graders ($z = 2.21, p < .05$). There were no other significant differences between grades and no significant differences in reasoning performance among college

freshmen, sophomores, juniors, and seniors, but more college seniors (63%) were formal deductive reasoners than were 12th graders (45%), ($z = 2.28, p < .05$). Finally, more high SES students (50%) were formal deductive reasoners than low SES students (29%), $\chi^2(1, N = 322) = 13.72, p < .001$, and more high ethnic identity students (45%) were formal deductive reasoners than were low ethnic identity students (33%), $\chi^2(1, N = 330) = 4.82, p < .05$.

Differences in Reasoning Performance and GPA Related to Ethnic Identity Level

Contrary to prediction from Ogbu's theory, as shown in the analyses above, high ethnic identity students had significantly higher reasoning scores than did those with low ethnic identity, whether using general solution scores, complete falsifications, or the deductive reasoning consistency criterion. To further test Ogbu's theory, a 4 (grade) \times 2 (SES) \times 2 (ethnic identity) ANOVA was computed on student GPAs (see Table 6). There was a significant effect for SES, $F(1, 298) = 4.05, p < .05$ ($f = .14$), and post hoc analyses confirmed that high SES students had better GPAs than did low SES students, $p < .05$, but there were no other significant effects or interactions.

Relation Between Self-Esteem and GPA

To test Steele's stereotype threat theory, the final analyses in this study examined the relationship between global self-esteem and school GPA. The correlation of these factors in the whole sample was significant and positive, $r = .27, p < .01$ (see Table 7). When analyzed by separate grade levels, however, a different pattern emerged, a pattern of decreasing correlations between self-esteem and GPA from 6th graders through 12th graders, consistent with Steele's school disidentification hypothesis. For 6th graders, the correlation between self-esteem and GPA was significant, $r = .45, p < .001$. For 10th and 12th graders, this correlation was not significant, $r = .18, p = .15$, and $r = .14, p = .21$, respectively. This study extended the investigation of Steele's disidentification hypothesis to include African American college students. Contrary to expectation, there was a strong positive correlation between global self-esteem and GPA in this sample of 115 college students, $r = .51, p < .001$. Tests confirmed that the self-esteem and GPA correlations for 10th and 12th graders were significantly different from the correlation for 6th graders, $z = 1.67$ and $z = 2.03$, respectively, $p < .05$, and for the college students, $z = 2.54$ and $z = 2.93$, respectively, $p < .01$. There were no significant differences

TABLE 6
Student GPA by Grade, SES, and Ethnic Identity Level

	<i>Grade</i>							
	<i>6th</i>		<i>10th</i>		<i>12th</i>		<i>College</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Grade	2.82	.70	3.04	.89	2.88	.52	3.02	.56
SES								
Low	2.78	.69	2.77	.95	2.87	.49	2.88	.51
High	2.88	.74	3.32	.80	2.98	.54	3.13	.59
Ethnic identity								
Low	2.80	.73	2.92	.89	2.72	.48	2.87	.63
High	2.79	.71	3.13	.92	2.96	.53	3.08	.53

NOTE: SES = socioeconomic status.

TABLE 7
Intercorrelations Among the Variables

	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
1. Age	—	.07	.06	.41***	.30***	.31***	.27***
2. GPA		—	.32***	.27**	.24**	.30***	.23**
3. SES			—	.01	.14*	.17**	.16**
4. Self-esteem				—	.39***	.12	.11
5. Ethnic identity					—	.30***	.24***
6. General solution scores						—	.88***
7. Complete falsification scores							—

NOTE: GPA = grade point average, SES = socioeconomic status.
 * $p < .05$. ** $p < .01$. *** $p < .001$.

between the correlations for the 10th and 12th graders or between those for the 6th graders and college students.

DISCUSSION

As hypothesized, consistent with cognitive developmental theory and the results of prior research with European American adolescents, this study found that deductive reasoning performance increased systematically across

adolescence in African Americans. Of 6th graders, 18% were consistently competent, formal deductive reasoners, compared to 39% of 10th graders, 45% of 12th graders, and 56% of college students. These results suggest that the ability to reason logically develops across adolescence, but more definitive conclusions require further studies, particularly longitudinal investigations that can provide more direct evidence of reasoning development than cross-sectional studies. Taken as a whole, though, the findings of this initial study of the development of deductive reasoning in African American adolescents agree with and lend considerable weight to the conclusion reached by Smith and Drumming (1989) in their deductive reasoning study with African American college students: "On balance, the results of this study challenge monolithic notions of cognitive development that universally ascribe deficits in reasoning ability to Blacks" (p. 236).

Despite the solid developmental progression of reasoning performance evidenced by the African American students in this study, the average level of selection task performance in each grade was lower than that reported in earlier studies using samples of mainly European American students (Chapell & Overton, 1998; Reene & Overton, 1989). Chapell and Overton (1998) found that 48% of 6th graders, 70% of 10th graders, and 80% of 12th graders were formal deductive reasoners. Reene and Overton (1989) also reported a higher rate of performance in their 3-year longitudinal study with cohorts of 6th graders and 8th graders. Reene and Overton found that 17% of their 6th-grade cohort were formal deductive reasoners in the 6th grade, increasing to 38% by 7th grade and 53% by 9th grade, whereas 38% of the 8th-grade cohort were formal deductive reasoners in 8th grade, increasing to 60% by 9th grade and 67% by 10th grade. It is important to note, however, that in both of these studies the participants were from upper-middle-class families. Given that high SES individuals consistently outscore low SES individuals on a variety of cognitive tests (Williams & Ceci, 1997), it seems fair to suggest that part of the deductive reasoning performance differences found between these two studies and the current study may be related to SES differences.

Indeed, given the well-established association between social class and cognitive performance, the relationship of SES differences to reasoning performance was investigated in this study. As hypothesized, high SES African American students significantly outperformed low SES students, with 50% of high SES students rated as formal deductive reasoners, compared to 29% of low SES students. High SES students also had significantly higher grades in school than did low SES students. These results agree with and add to previous research, which has shown that higher SES adolescents consistently perform better on IQ and achievement tests than do lower SES students

(Neisser et al., 1996; Suzuki & Valencia, 1997; Williams & Ceci, 1997), a performance advantage related to the lower school quality, lower support at home for school success, reduced access to educational resources, and higher levels of stress that are more often experienced by low SES students (McLoyd, 2000; Steinberg, 1999). The findings of this study based on SES differences must be interpreted with caution, however, because the measure of SES used in this study relied exclusively on a parental education criterion, and whereas this is one basic index of SES, standard SES measures generally examine at least one other factor, such as parental occupation, employment status, or income (Entwisle & Astone, 1994).

OGBU'S CULTURAL-ECOLOGICAL THEORY

Ogbu's influential theory predicts that adolescents with more developed ethnic identities will have lower reasoning scores and GPAs than those with less developed ethnic identities because reasoning and school tests will be seen as part of the White cultural frame of reference and resistance to "acting White" will depress performance. These hypotheses were not supported in this study with primarily inner-city Black youth; to the contrary, a more developed ethnic identity was related to better reasoning performance and no relationship was found between ethnic identity level and GPA. In this study, participants apparently did not view solving a demanding set of reasoning problems or doing well in school as threats to their ethnic identity, requiring poor performance to avoid crossing "cultural and cognitive boundaries."

One possible explanation for the positive relationship between reasoning performance and ethnic identity, and the lack of any negative relationship between ethnic identity and GPA found in this study, is that social conditions in America are not the same in 2000 as they were in the early 1970s, when Ogbu (1974) originally formulated his theory. Ogbu has long contended that African Americans have been prevented from fully using their cognitive capacities due to substandard schooling and racist exclusion from middle-class jobs reserved for European Americans. However, over the past 30 years, the educational and employment opportunity outlook for Blacks in America has gradually improved, due in part to long-term effects of hard-won civil rights and antidiscrimination legislation, better access to higher education, and affirmative action (Garibaldi, 1997). African American adolescents today may realistically aspire to go to college and obtain middle-class jobs and may thus see performance on cognitive tests as more of a real means for achieving success than did previous generations.

This view is supported by the fact that the percentage of African Americans age 25 to 29 having completed high school is the highest in history

(88.7%), as is the percentage of African American high school graduates having completed some college (57.8%) (National Center for Educational Statistics, 2000). Further evidence supporting this view is the trend over the past 30 years toward closing the gap between European American and African American cognitive test scores (Grissmer, Flanagan, & Williamson, 1998; Hedges & Nowell, 1998; Williams & Ceci, 1997), a convergence particularly evident in college graduates (Myerson, Rank, Raines, & Schnitzler, 1998). Taken as a whole, perhaps the issue of performing well on cognitive tests for African Americans circa 2000 is becoming somewhat less of a hard choice between individual achievement and ethnic group solidarity. It is important to note, however, that this study investigated only one key part of Ogbu's theory, namely, the relationship between African American adolescents' ethnic identity and their cognitive performance, and a more comprehensive test of Ogbu's far-reaching model was beyond both the scope and aims of this study.

STEELE'S STEREOTYPE THREAT THEORY

Based on Steele's (1992, 1997, 1998, 1999) stereotype-threat theory, due to having to cope with the stressful threat of being judged by or confirming the racist, negative stereotype of African American intellectual inferiority, it was expected that African Americans would distance themselves from school performance during adolescence. Thus, global self-esteem might be significantly correlated with GPA in 6th graders but not in high school and college students. This school disidentification hypothesis was partially supported because the correlation between self-esteem and GPA decreased from a strong positive relationship in 6th graders to a nonsignificant relationship in 10th and 12th graders. This study extended the investigation of the school disidentification hypothesis to college students and, against expectation, there was a strong positive correlation between global self-esteem and GPA in this sample of 115 African American undergraduates. It is important to note here that there were no significant differences in either SES or GPA among the 6th-, 10th-, 12th-grade, and college students who participated in this study.

One possible explanation for this association between GPA and self-esteem in African American college students is suggested by the work of Myerson et al. (1998). Using cognitive ability test data collected in the National Longitudinal Survey of Youth, Myerson et al. compared the performance of 120 African Americans and 600 European Americans from 8th grade through college completion. After controlling for differences in school attrition rates, SES, and age, European American test scores were found to

increase substantially during high school, whereas African American scores did not. In sharp contrast, between the time of high school graduation and college graduation, test scores of African Americans increased at a rate four times greater than those of European Americans. Thus, whereas European Americans had higher average test scores than African Americans from 8th grade through college, the size of this gap was reduced from 1.1 standard deviations at high school graduation to just 0.4 standard deviations by the end of college. Myerson et al. suggested that the large and widening test score gap between European Americans and African Americans in high school, and the substantial closing of this gap in college, might be due to disparity in the quality of high school education and the subsequent equal quality of the college education experienced by these groups.

Many African Americans attend de facto segregated secondary schools of lower quality than those attended by European Americans and have lower academic performance, even after controlling for SES differences (Garibaldi, 1997; Yancey & Saporito, 1997). African Americans often receive lower quality education than European Americans, even in integrated schools (Fisher et al., 1998). Once in college, however, African Americans and European Americans experience more comparable education (National Center for Educational Statistics, 1995). In the current study, African Americans may have become disidentified from academic success in high school, as suggested by the lack of association between self-esteem and GPA in the 10th and 12th graders. However, the correlation between self-esteem and academic achievement was as strong in college students as in 6th graders, suggesting a possible pattern of resilient recovery during college analogous to that described by Myerson et al. (1998).

These interpretations must be tempered by the fact that the measure of GPA used in this study was a self-report scale that, although widely used (as in Osborne's 1995 and 1997 studies cited above) and highly correlated with actual grades taken from school records in previous studies (Dornbusch et al., 1987; Steinberg et al., 1994), also has been found to slightly overstate the GPA of students who were averaging a C or less in school. What is less ambiguous is that further investigation into the relationship of African American college student global self-esteem and GPA is needed to test the school disidentification hypothesis of Steele's increasingly influential stereotype threat theory. Whereas the negative impact of stereotype threat on African American college students' test performance and disidentification from school has been well demonstrated under experimental conditions using various cognitive tests (Major, Spencer, Schmader, Wolfe, & Crocker, 1998; Steele & Aronson, 1998), to date there have been no large-scale studies published examining the relationship between global self-esteem and college

GPA in African American college students and students from other ethnic groups.

SUMMARY

In conclusion, the main developmental finding of this study was that African Americans showed a clear pattern of progress in deductive reasoning performance from early through late adolescence. On average, the 6th-grade, preteen participants were not consistently logical reasoners, whereas the high school students reasoned better than the 6th graders but not as well as the college students, who were entering adulthood having developed consistently strong logical reasoning skills. This study also found that cognitive performance was significantly related to contextual factors, with high SES students consistently outscoring low SES students in reasoning and grades.

Ogbu's cultural-ecological theory, which predicts an inverse relationship between cognitive performance and ethnic identity strength in African American adolescents, was not supported because better reasoning performance was associated instead with stronger ethnic identity. Steele's stereotype-threat school disidentification thesis, which predicts that African American global self-esteem and GPA would be associated in early adolescence but become dissociated thereafter, was partially supported. Self-esteem and GPA were strongly related in 6th graders, not significantly related in high school students, yet strongly related in college students.

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