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The Effect of Biracial Status and Color on Crystallized Intelligence in the U.S.-Born African–European American Population

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Abstract: The relationship between biracial status, color, and crystallized intelligence was examined in a nationally representative sample of adult Black and White Americans. First, it was found that self-identifying biracial individuals, who were found to be intermediate in color and in self-reported ancestry, had intermediate levels of crystallized intelligence relative to self-identifying White (mostly European ancestry) and Black (mostly sub-Saharan African ancestry) Americans. The results were transformed to an IQ scale: White (M = 100.00, N = 7569), primarily White–biracial (M = 96.07, N = 43, primarily Black–biracial (M = 94.14 N = 50), and Black (M = 89.81, N = 1381). Next, among self-identifying African Americans, a statistically significant negative correlation of $r = -0.102$ (N = 637) was found between interviewer-rated darker facial color and vocabulary scores. After correction for the reliability of the measures, this correlation increased to $r = -0.21$. Corrections for the validity of color as an index of African ancestry would raise this correlation to around $r = -0.48$. This association among self-identifying African Americans was not accounted for by confounding factors, such as region of residence and interviewer race, or by parental socioeconomic status and individual educational attainment. In the multivariate models, the standardized betas for color and crystallized intelligence among African Americans ranged from $\beta = -0.112$ to $\beta = -0.142$. Based on the coefficients from the multivariate analysis, it was further found that cognitive ability was a significant mediator in the context of color and education, while education was not in the context of color and cognitive ability. It is concluded that these results further substantiate the statistical relation between intelligence and biogeographic ancestry in African and European American populations.

Keywords: skin color; African Americans; intelligence

1. Introduction

Lynn (2002a) [1] analyzed the 1982 General Social Survey (GSS) and found a small but significant correlation between interviewer-rated skin color and Wordsum vocabulary scores in the self-identifying African American population ($r = 0.17$, $p < 0.01$, $N = 430$) [1]. As skin color moderately correlates with African ancestry in the African American population ($rs = 0.44$) [2], Lynn (2002a) [1] took this association as confirmatory evidence that European genetic ancestry positively correlates with cognitive ability in this population [1]. These results have been cited as evidence in favor of a hereditarian hypothesis for racial differences in intelligence [3].

Both Lynn's methodology and inference have been criticized. For example, Hill (2002) [4] pointed out that Lynn's (2002a) [1] analysis was a simple bivariate one, which failed to take into account potential confounding factors, such as region of residence, sex, and age [4]. Hill (2002) [4] also challenged Lynn's (2002a) [1] hereditarian interpretation. He argued that any possible association found could be a consequence of color-based discrimination in the labor market or of family socioeconomic status (SES) (for a rejoinder, see reference [5]). Hill (2002) [4] concluded the "there is no evidence to support his genetic hypothesis that racial admixture promotes higher intelligence in African Americans" since "family background and educational attainment" can statistically explain the association [4].

The exchange between Lynn (2002a; b) [1,5] and Hill (2002) [4] raises at least three issues of interest: Does color robustly correlate with cognitive ability among African Americans? Is color acting as a proxy for European ancestry? What is the cause of the association?

Relevant to this discussion is a small body of older research which investigated the association between intelligence scores and mostly phenotypic and genealogical indices of biogeographic ancestry (e.g., reference [6]). To be clear, by "biogeographic ancestry (BGA)," we mean geographic–racial ancestry in the natural scientific sense (for conceptual clarification, see reference [7]). Also pertinent is an extensive body of research on the relation between socioeconomic status and BGA. A meta-analysis of this has shown that European ancestry, relative to African and Amerindian, is positively correlated with higher SES throughout the Americas (r = 0.18, K = 28, N = 35,476.5; [8]). Since SES and intelligence scores moderately to strongly covary, one would anticipate that intelligence scores and BGA would likewise correlate. Of additional relevance is the finding that, on the regional and international levels, skin brightness/reflectance, along with genetic ancestry, strongly predicts national cognitive ability scores [9–12]. These results offer ecological support for the position that BGA predicts intelligence on the individual level. Nonetheless, while indices of BGA are generally acknowledged to be correlated with SES in admixed populations—in sociology, this association is often interpreted as evidence of race-associated phenotypic-based discrimination, called "colorism" [13]—whether these indices do so with cognitive ability continues to be disputed [14,15].

The purpose of this paper is to test the hypothesis [1,9] that indices of BGA are associated with cognitive ability scores in African and European American populations. First, we determine if self-reported biracial status is associated with intermediate cognitive performance in the context of White (mostly European) and Black (mostly sub-Saharan African) Americans. In this analysis, we also examine if, as expected, self-reported biracial individuals are also intermediate in interviewer-reported color and in self-reported racial background. These latter associations are examined to determine if self-reported biracial status corresponds with intermediate genetic ancestry. While expected, this need not be the case.

Second, we revisit the claim of Lynn (2002) [1,5] that there is an association between color and cognitive ability among African Americans, an African–European hybrid population. Before proceeding, we examine the reliability of the measures using GSS panel data. To further examine the effect of range restriction, we examine correlations in the full Black and White American sample. After, we illustrate the effect of correcting for the reliability of the measure of cognitive ability and color. Next, following the advice of Hill (2002) [4], we conduct multivariate analyses to see if the associations are robust to demographic controls. Finally, to address the possibility of reverse causation (in this case, that color-associated educational differences cause cognitive ability ones), we conduct mediation analyses to see if education mediates the relation between color and cognitive ability or vice versa.

2. Materials and Methods

For the self-reported mono-race and mixed-race analysis, we used the 2000 to 2016 GSS cross-sectional waves. For the color by crystallized intelligence analysis, we used the 2012, 2014, and 2016 waves of the cross-sectional GSS, which is conducted by the National Opinion Research Center (NORC). This nationally representative survey is the same as that used by Lynn (2002a) [1] and by Hill (2002) [4]. To assess the reliability of both color and crystallized intelligence, we used the 2012 and 2014 GSS panel survey. All analyses were conducted using SPSS 24.

As there is debate in the literature about the appropriateness of weighting when dealing with relatively small subgroups, weighted and unweighted results are reported for the mean and correlational results. The weighted results are nationally representative. For the cross-sectional data, the weight WTSSALL was used. For the panel data, the weight WTPANNR123 was used.

2.1. Race, Nativity, and Ethnicity

We limited the sample to U.S.-born individuals. This was because, first, natives and immigrants may have different patterns of scores owing to linguistic bias and/or migrant selection. For similar reasons, the African American sample was limited to non-Hispanic Blacks. Second, admixture models, such as proposed by Lynn (2002a) [1], make no necessary prediction about the relation between indices of European ancestry and outcomes among African immigrants, who, if from Africa, may have little to no recent European ancestry. In this case, color would not index ancestry.

From 2000 on, participants were allowed to select up to three races (Racecen1–3). We identified biracial White–Black individuals based on all combinations of the three multiple race variables. Individuals were classified as biracial White–Black if they selected "White" and "Black" as two of three possible racial identities.

Participants were also asked about their primary racial identification (Race: "What race do you consider yourself?"). Further, they were asked if they were Hispanic. A person was defined as non-Hispanic Black (from now on "Black") if their primary racial identification was Black and if they identified as not Hispanic. Mutatis mutandis, a person was defined as non-Hispanic White (from now on "White") if their primary racial identification was White.

2.2. Color

In the 2012–2016 waves, interviewers were asked to rate, with the use of a color card, the individual's facial color/tone on a 10-point scale with 1 being the lightest and 10 being the darkest. The color cards were based on Massey and Martin's Skin Color scale [16]. Since this scale takes into account both brightness and hue, it is properly referred to as a "color" scale.

2.3. Self-Reported White Ancestry

In the 2016 wave, respondents were asked to describe their degree of White racial or ethnic background using a 10-point scale (variable: RACETHWH). No individuals who had valid responses to this variable had cognitive scores. However, individuals with RACETHWH had color scores. We used this variable to validate the other BGA indicators (i.e., self-reported race and color).

2.4. Cognitive Ability

Participants were given a 10-question vocabulary quiz. The sum of the correct answers is called Wordsum. Wordsum scores strongly correlate with measured intelligence ($r = 0.71$) [17]. We note that we tried IRT (Item Response Theory) scores as an alternative as they have previously been found to have increased reliability [18], but the effect was non-substantial, so we used simple Wordsum scores to aid replicability.

In the 2006 to 2016 GSS survey, individuals were asked a sample of 13 science-related questions (odds1 to solarrev). Not all individuals were asked the same set of questions. The correct answers were summed and divided by the number of questions to give a science knowledge mean score, which is taken as another, albeit poorer, measure of crystalized intelligence.

2.5. Education

Participants reported their highest year of education (coded 0–20, with 0 indicating no schooling and each subsequent number representing a year of schooling, with up to 8 years of college and post-baccalaureate education). Variables for mother's and father's education used the same format.

2.6. Demographic Controls in the Regression Analysis

In the multivariate analyses for color, following Hill (2002) [4], we included as controls age, sex, and region of residence at age 16 (coded as South vs. non-South). Following Kreisman and Rangel (2015) [19], we added controls for interviewer race, since race has been found to affect color evaluations. We also added a variable for biracial White–Black identification. This is because biracial White–Black individuals could be seen as representing a distinct cultural identity (for an argument along these lines, see reference [20]). If this is the case, any association between color and outcomes could be mediated by an association between color and White–Black cultural identity. Since we were interested in the association between color and outcomes independent of self-identified race, we included a dummy variable for biracial identity.

In the second model, we added a control for the respondent's education. For the regression analysis, education was imputed for one case based on parental education, parental occupational prestige, and parental socioeconomic index (see below).

In the third model, we included a variable for parental SES. Parental SES was computed by applying principal component analysis (PCA) to the following variables: parental education (the average of paeduc and maeduc), parental occupational prestige (the average of papres105plus and mapres105plus), and parental socioeconomic index (the average of pasei10 and masei10). Missing data for 89 cases were imputed before PCA (using education, parental education, parental occupational prestige, and parental socioeconomic index).

3. Results

3.1. Comparison of Means

Table 1 shows the weighted 2000–2016 Wordsum quotients (along with the Wordsum means and standard deviations), the 2012–2016 Wordsum quotients, the 2012–2016 skin color scores, and the degree of White ancestry self-reported in 2016. These are shown for Whites, mixed-race individuals who primarily identify as White, mixed-race individuals who primarily identify as Black, Blacks, and the total Black and White American sample. Wordsum quotients were calculated relative to the White mean using the total sample standard deviation for the given time period. *N* in this case is the sample weight, which represents the sample size weighted by the number of people in the population who are represented by each member. Since these results are weighted, they are nationally representative.

As can be seen, self-identifying mixed-race individuals are intermediate in skin color, crystalized intelligence, and self-reported White ancestry. As expected, mixed-race individuals who primarily identify as White have higher Wordsum scores, are lighter in color, and report more White background than do mixed-race individuals who primarily identify as Black.

Table 1. Race, Wordsum, color, and degree White (weighted results).

Race	2000–2016 WQ (Wordsum M; SD)	Weight *N*	2012–2016 WQ (Wordsum M; SD)	Weight *N*	2012–2016 Color	Weight *N*	2016 Degree White	Weight *N*
White	100.00 (6.43; 1.82)	7569	100.00 (6.41; 1.76)	2958	1.57 (0.93)	3888	9.50 (1.55)	593
White–Black (Primary race: White)	96.07 (5.94; 1.70)	43	95.73 (5.90; 1.79)	28	3.71 (1.83)	42	3.58 (1.56)	9
White–Black (Primary race: Black)	94.14 (5.70; 2.20)	50	91.87 (5.44; 1.64)	26	4.87 (1.75)	36	2.33 (1.30)	6
Black	89.81 (5.16; 1.74)	1381	90.70 (5.30; 1.66)	599	5.63 (1.99)	845	0.28 (1.03)	129
Total	98.40 (6.23; 1.87)	9043	98.32 (6.21; 1.79)	3611	2.32 (1.97)	4811	7.76 (3.85)	736

Note: WQ is the Wordsum score set on an IQ metric, with the White mean set to 100 for each time period and SDs of 15; total sample SDs were used for the conversion. Weighted *N* is the sample weighted *N*, which represents the sample size weighted by the number of people in the population who are represented by each member.

Table 2 shows the same results as above but without sample weights. *N* in this case represents the number of individuals interviewed. As can be seen, the results are substantially the same as those reported in Table 1.

Table 2. Race, Wordsum, color, and degree White (unweighted results).

Primary Race	2000–2016 WQ (Wordsum M; SD)	*N*	2012–2016 WQ (Wordsum M; SD)	*N*	2012–2016 Color	*N*	2016 Degree White	*N*
White	100.00 (6.46; 1.86)	7617	100.00 (6.42; 1.82)	3022	1.56 (0.94)	4067	9.52 (1.49)	600
White–Black (Primary race: White)	95.05 (5.83; 1.71)	40	94.97 (5.80; 1.85)	25	3.53 (1.75)	40	3.44 (1.67)	9
White–Black (Primary race: Black)	93.87 (5.68; 2.02)	53	93.59 (5.63; 1.69)	30	4.83 (1.76)	41	2.75 (1.71)	4
Black	89.87 (5.17; 1.74)	1515	90.51 (5.25; 1.68)	657	5.62 (1.97)	919	.36 (1.23)	138
Total	98.27 (6.24; 1.91)	9225	98.22 (1.85)	3734	2.34 (1.99)	5067	7.73 (3.88)	751

Note: WQ is the Wordsum score set on an IQ metric, with the White mean set to 100 for each time period and SDs of 15; total sample SDs were used for the conversion. *N* is the sample size.

3.2. Reliability of Color and Wordsum

Since both Lynn's (2002a) [1] hereditarian and Hill's (2002) [4] family background and discrimination models assume that measured color is a relatively stable feature of an individual, we assessed the reliability of the index using the 2010–2014 panel GSS (years 2012–2014). We limited cases to individuals who identified in both waves as non-Hispanic, African American, and U.S. born. Below, we report the single measure, intraclass correlations (ICCs).

The unweighted and weighted one-way random, consistency, inter-rater reliabilities (ICC) for color are 0.27 [95% CI: 0.11, 0.41] and 0.39 [95% CI: 0.25, 0.52], respectively (N = 144). Similarly, low reliabilities have been found by others (e.g., reference [21]). Note, for these, we did not regress out the effect of interviewer race. The unweighted and weighted two-way mixed, consistency, test–retest reliabilities (ICC) for Wordsum are 0.52 [95% CI: 0.38, 0.64] and 0.59 [95% CI: 0.46, 0.69], respectively (N = 124).

Low ICCs can reflect either unreliability of a measure or the effect of low variability and small sample sizes. As a result, there are no standard values for assessing reliability [22]. The Wordsum scores are unlikely to suffer as severely from range restriction. In the case of color, variability is reduced relative to a hypothetical randomly admixed population, since only the self-identifying Black American sample is examined.

3.3. Correlations

Table 3 shows the weighted correlation matrix for Wordsum, science knowledge, color, highest year of education, and self-reported degree of White background. The correlation between science knowledge and Wordsum scores is low. This is likely because science knowledge computed from the given questions is a poor index of ability. The reduced correlation, relative to Wordsum, with highest year of education strongly suggests this. The correlation between darker color and Wordsum is significant at $r = -0.102$ (N_{sample} = 637). The correlation between darker color and science knowledge is nonsignificant at $r = -0.069$ (N_{sample} = 462). The latter is 68% the size of the correlation between color and Wordsum, which is concordant with the reduced validity of the science knowledge scores. (The correlation between science knowledge and education is 71% of that between Wordsum and education.) Color also significantly correlates with highest year of education at $r = -0.085$ (N_{sample} = 958). Color weakly correlates with degree White (*ns*). The weak correlation between color and self-reported degree White is expected as most African Americans are unaware of their precise degree of European genetic ancestry (e.g., reference [23]) and as there is range restriction in the degree of White background in this population.

Table 3. Weighted correlation matrix for Wordsum, science knowledge, color, highest year of education, and self-reported degree White among African Americans.

	Science Knowledge (Weighted *N*)	Color (Weighted *N*)	Highest Year of Education (Weighted *N*)	Degree White (Weighted *N*)
Wordsum	0.328 * (566)	−0.102 * (574)	0.371 * (1428)	
Science Knowledge		−0.069 (423)	0.265 * (939)	
Color			−0.085 * (880)	−0.155 (133)
Highest year of education				0.077 (134)
Degree White				

Note: * Significant at the 0.05 level (two-tailed). Weighted *N* is the sample weighted *N*, which represents the sample size weighted by the number of people in the population who are represented by each member.

Table 4 shows the unweighted results. These are substantially the same as those shown in Table 3.

Table 4. Unweighted correlation matrix for Wordsum, science knowledge, color, highest year of education, and self-reported degree White among African Americans.

	Science Knowledge (*N*)	Color (*N*)	Highest Year of Education (*N*)	Degree White (*N*)
Wordsum	0.331 * (639)	−0.109 * (637)	0.369 * (1565)	
Science Knowledge		−0.051 (462)	0.290 * (1044)	
Color			−0.061 * (958)	−0.176 * (140)
Highest year of education				0.110 (141)
Degree White				

Note: * Significant at the 0.05 level (two-tailed). *N* is the sample size.

For comparison, Table 5 shows the unweighted results for the combined, U.S.-born non-Hispanic Black and White American sample. These effect sizes can be compared with those in Table 4 to assess the effect of range restriction. In this combined sample it can be seen that color is strongly related to self-reported White ancestry.

Table 5. Unweighted correlation matrix for Wordsum, science knowledge, color, highest year of education, and self-reported degree White among Black and White Americans.

	Science Knowledge (*N*)	Color (*N*)	Highest Year of Education (*N*)	Degree White (*N*)
Wordsum	0.439 * (3880)	−0.239 * (3348)	0.466 * (9212)	
Science Knowledge		−0.257 * (2459)	0.398 * (6282)	
Color			−0.109 * (5063)	−0.757 * (712)
Highest year of education				0.140 * (750)
Degree White				

Note: * Significant at the 0.05 level (two-tailed). *N* is the sample size.

3.4. Corrections for the Reliability of the Measures and the Validity of Color as an Index of Ancestry

In the African Americans sample, the bivariate association between darker color and cognitive ability is $r = -0.102$. Applying the standard formula to correct the correlation for unreliability in both color and Wordsum [24], given the weighted ICCs noted in Section 3.2, this correlation rose to $r = -0.21$. We note that correcting for unreliability in the color measure also partially corrects for range restriction in color (and, with it, in ancestry). As such, this figure represents what the correlation would be in a population less restricted in range in admixture. One might further correct for the validity of color as an index of European ancestry. This requires two assumptions: (1) that the Massey–Martin color scale shows roughly the same relation with genetic ancestry as does spectrophotometer-measured skin reflectance and (2) that the relation between color and cognitive ability is mediated by European ancestry. Granting these assumptions, the correlation would increase to around $r = -0.21/0.44 = -0.48$. However, it is not known to what extent the association between cognitive ability and color is statistically explainable by that between cognitive ability and ancestry.

3.5. Regression Analyses

Next, we conducted regression analyses, limiting our focus to the African American sample. We considered only the African American sample because we are interested in examining to what extent the race- or ancestry-related differences show up within admixed or hybrid groups; of the two groups under consideration, the African American one is the only significantly admixed one. Since weighted and unweighted results were substantially the same, we report only the weighted results in Tables 6 and 7. Table 6 shows the descriptive statistics.

Table 6. Descriptive statistics for the regression analysis.

Variable	Mean	SD	Weighted *N*	*N*
Wordsum	5.294	1.634	574	637
Color	5.585	1.943	574	637
Age (in years)	44.414	16.201	574	637
Sex (Female = 1)	0.604	0.490	574	637
Year_2012	0.247	0.432	574	637
Year_2014	0.329	0.470	574	637
Region (South = 1)	0.603	0.490	574	637
Interviewer (White = 1)	0.599	0.490	574	637
Interviewer (Black = 1)	0.273	0.446	574	637
Interviewer (Hispanic = 1)	0.050	0.218	574	637
Biracial (Biracial = 1)	0.041	0.198	574	637
Respondent's Education (1 case imputed)	13.196		573.9	637
Parental Socioeconomic Status (SES) (89 cases imputed)	0.01		573.9	637

Model 1 shows the results with controls for age, sex, year, region, interviewer race, and mixed-race status. Darker color was significantly negatively associated with Wordsum scores ($\beta = -0.142$). When education was added to Model 2, the association decreased to $\beta = -0.116$. When parental SES was added to Model 3, the association remained virtually the same at $\beta = -0.112$.

Table 7. Skin color, controlling for sex, age, year, region, interviewer race (Model 1), education (Model 2), and parental SES (Model 3) as predictors for vocabulary test scores.

Variable	Model 1		Model 2		Model 3	
	B (*SE B*)	β	*B* (*SE B*)	β	*B* (*SE B*)	β
(Constant)	7.046 (0.384)		3.147 (0.514)		3.160 (0.514)	
Skin Color	−0.119 (0.036)	−0.142 *	−0.097 (0.033)	−0.116 *	−0.094 (0.033)	−0.112 *
Age (in years)	−0.009 (0.004)	−0.091 *	−0.009 (0.004)	−0.091 *	−0.008 (0.004)	−0.075
Sex (Female = 1)	−0.070 (0.137)	−0.021	−0.247 (0.126)	−0.073	−0.238 (0.127)	−0.071
Year_2012	−0.287 (0.171)	−0.077	−0.195 (0.157)	−0.052	−0.186 (0.157)	−0.050
Year_2014	−0.298 (0.157)	−0.084	−0.219 (0.144)	−0.061	−0.212 (0.144)	−0.060
Region (South = 1)	−0.402 (0.139)	−0.119 *	−0.255 (0.129)	−0.075 *	−0.242 (0.129)	−0.071
Interviewer (White = 1)	0.000 (0.254)	0.000	0.164 (0.233)	0.048	0.155 (0.234)	0.046
Interviewer (Black = 1)	−0.734 (0.273)	−0.195 *	−0.464 (0.251)	−0.124	−0.471 (0.251)	−0.125
Interviewer (Hispanic = 1)	−0.328 (0.382)	−0.044	−0.127 (0.351)	−0.017	−0.162 (0.352)	−0.022
Mixed Race	−0.323 (0.342)	−0.039	−0.124 (0.314)	−0.015	−0.138 (0.314)	−0.016
Respondent's Education			0.270 (0.026)	0.405 *	0.262 (0.027)	0.393 *
Parental SES					0.084 (0.072)	0.050
Observations	637		637		637	

Note: $N = 637$; B = unstandardized regression coefficient with the standard error in parentheses; β = standardized regression coefficient.

To explore the data further, we tested for mediation using the variables in Model 2 ([25]; Aroian test). While Wordsum is a significant mediator of the color–education association (Sobel test = -3.14, $p < 0.002$, $N = 637$), education is not a significant mediator of the color–Wordsum association (Sobel test = -1.46, $p = 0.15$, $N = 637$). These results are consistent with a model in which the pathway runs from ancestry, or at least race-related phenotype, to cognitive ability and then to social outcomes.

4. Conclusions

In this sample, the bivariate association between darker color and cognitive ability was $r = -0.102$. Applying the standard formula to correct the correlation for unreliability in both color and Wordsum raises the correlation to $r = -0.21$. Generally, the results confirm that observed skin color and cognitive ability are correlated in the African American population.

The magnitude of the effect is similar to that previously reported in the literature [26,27]. While some have argued that effect sizes between *rs* = 0.10 and 0.20 are inconsistent with the hypothesis of a large effect associated with ancestry [26,27], this is incorrect. As Kirkegaard, Woodley of Menie, Williams, Fuerst, and Meisenberg (2019) demonstrated, the expected correlation between a good measure of genetic ancestry and trait would be small for the given population owing to restriction of the range in ancestry [28]. Any reduction in validity of the measure of ancestry would further bias the association with ancestry towards zero. Thus, contra what has sometimes been claimed [26,27], one could not expect a more than small correlation given the population examined and the measures used.

The multivariate results differ from Hill's (2002) [4], based on the 1982 GSS data, in that neither parental SES nor respondent education statistically explained away the results. This is surprising since education is typically highly associated with measures of intelligence and so controlling for both respondent education and parental SES (which includes parental education) is expected to control for IQ, especially if differences are due to intergenerational factors. However, in this sample, Wordsum scores were only moderately to weakly correlated with individual education and parental SES (respectively, $r = 0.414$ and $r = 0.201$, $N = 637$ for the African American sample with imputations). As a result, despite the non-zero bivariate correlation between color and individual education ($r = -0.055$, $N = 637$) and between color and parental SES ($r = -0.092$, $N = 637$), little of the association between color and Wordsum was attributable to these variables. Nonetheless, it was found that Wordsum scores were a significant mediator with respect to the association between color and individual education.

These results also confirm the intermediate status of racially mixed individuals. Similar results have been found in other nationally representative samples (e.g., [20,29]). While self-reported mixed-race status need not correspond with intermediate genetic admixture, it happens to in the case of U.S. self-identifying biracial Black–White individuals (e.g., [30], Table 3). Given the results, the most parsimonious explanation is that European genetic ancestry correlates with cognitive ability among self-identifying African Americans, as found by Kirkegaard et al. (2019) [28]. This interpretation is consistent with a large number of—though not all—older studies [6] and with studies on the relation between genetic ancestry and individual SES [8]. It is also consistent with the finding that regional genetic ancestry predicts regional cognitive and SES outcomes across the Americas [31–33].

Nonetheless, on the individual level, it is possible that IQ could be associated with color or other race-related phenotypes independent of ancestry as suggested by some (e.g., [34] pp. 140 and 481–482). Such associations could result from color-based discrimination or from cross-assortative mating for race-associated phenotype and IQ. The latter would occur if there was both assortative mating for race-associated phenotype and for IQ at the same time in a given population. This would result in an extrinsic genetic correlation between the two variables. While these are not the most consilient explanations, they are worth consideration. The cross-assortative mating hypothesis could be explored by including reliable indices of color (or other specified phenotypes), IQ, SES, and genetic ancestry in a global admixture analysis and by examining the path relations.

Regardless, the association between measured cognitive ability and color indicates that cognitive ability is at least a potentially important omitted variable in much of the "colorism" literature. This possibility, that the association between phenotypic indices of race and social outcomes could be statistically explained by cognitive ability, is rarely considered by proponents of the "colorism" paradigm (e.g., [35]).

We urge proponents of discriminatory models to include measures of cognitive ability and other aspects of human capital, in addition to genetic ancestry, into analyses. Concerns about reverse causality (in this case, individual SES $\rightarrow$ cognitive ability) can be addressed using longitudinal data and by looking at the extent to which cognitive ability measured prior to completing schooling and/or entering the workforce explains completed education and/or employment outcomes [36,37].

Generally, the results found here are congruent with a hereditarian hypothesis for the cause of the Black–White American intelligence differences (e.g., [3]). As null results would have provided support against a hereditarian model, the finding that self-reported mixed-race individuals perform intermediately and of an association between color and cognitive ability provides "modest support" for a genetic hypothesis [26]. Of course, these results could be consistent with a number of environmental-only models. Either way, these effects are in need of an explanation.

5. Limitations

As noted by others (e.g., [21]), the color measure has low reliability. This may bias coefficients for color downward. Also, it is not clear what the color scale's validity is as a measure of African/European ancestry. While pigmentation has a modest correlation with genetic ancestry in Afro-European populations, gestalt facial appearance has a higher one. For example, Rodgers (2012) found an $R^2 = 0.83$ between genetic ancestry and interviewer's estimated racial ancestry based on facial appearance (though, in this sample, there appears to be little range restriction) [38]. It is not clear if GSS interviewers simply rated facial color or if they inadvertently rated gestalt racial appearance.

Additionally, a 10-question vocabulary test, as used here, is not a very reliable measure of general cognitive ability. This is likely why the two-year test–retest reliability was relatively low for a measure of intelligence. Future research should investigate if this association is robust using a higher-dimensional measure of cognitive ability.

Furthermore, reverse causality between IQ and outcomes, as suggested by Hill (2002), is a possibility. To some extent, this can be addressed by looking at the association between cognitive ability as measured in adolescence and outcomes in adulthood using longitudinal studies (e.g., [19]).

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