The Temporal Stability of In-Group Favoritism Is Mostly Attributable to Genetic Factors

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Abstract

Twin studies of in-group favoritism have reported roughly equal influences of genetic and environmental factors. All, however, have solely relied on cross-sectional approaches, leaving open the question of whether genetic and environmental factors have similar roles on stability and change for in-group favoritism across time. While in-group favoritism is commonly perceived to reflect environmental influences, stable environmental effects are rare for psychological traits, thus suggesting that genetic influences may play the major role in the stability of favoritism. Here, we used addressed this issue using a 10-year (two waves) longitudinal twin design. In-group favoritism showed high rank-order stability ($r = .67$). Seventy four percent of this rank-order stability was attributable to genes. A broadly similar pattern was observed for race, ethnic, and religious favoritism. By contrast, changes in favoritism almost entirely reflected nonshared environmental influences. These findings indicate that environmental influences underpin change in favoritism, while the stability of favoritism mostly reflects genetic influences.

Keywords

Understanding the origins of group-based favoritism is an important scientific task (Paluck & Green, 2009), particularly given its roles in both cooperation and conflict (Fiske, 2002). Work in multiple fields has contributed to our understanding of favoritism, including evolutionary (Kurzban, Tooby, & Cosmides, 2001; Schaller, Park, & Faulkner, 2003), social-psychological (Lai et al., 2014; Pettigrew & Tropp, 2006), and personality (Akrami, Ekehammar, & Bergh, 2011; Sibley & Duckitt, 2008) approaches. Recently, quantitative genetic studies have also been used to address the etiology of individual differences in favoritism (Kandler, Lewis, Feldhaus, & Riemann, 2015; Lewis & Bates, 2010, 2014; Orey & Park, 2012). Summarizing findings across multiple genetically informative studies, genetic factors account for one third to one half of observed variation in intergroup attitudes, with weak influences of shared environmental factors (i.e., influences that serve to make individuals in the same family more alike) and large effects of nonshared environmental factors (i.e., influences that serve to make individuals in the same family *less* alike; e.g., Lewis & Bates, 2010).

These findings have helped extend knowledge regarding the sources of individual differences underlying in-group favoritism. However, because all existing studies have been cross sectional, it is unknown whether genetic and/or environmental factors influence stability and change in such attitudes over time. At the phenotypic level, intergroup attitudes typically show substantial temporal stability. For example, the U.S. National Election Study data from 1956 to 1960 and 1972 to 1976 revealed 5-year racial policy attitude correlations of .51 and .57, respectively, for these two periods (Krosnick, 1991). Even higher stability was reported in a large representative sample of German adults, with correlations of .72 to .78 for prejudice across a 2-year interval (Wagner, Christ, & Pettigrew, 2008). Combined with knowledge of genetic and environmental influences on attitudes, these observations raise a question: To what degree do genetic and/or environmental influences contribute to this stability (and, correspondingly, to change)?

Research on the major dimensions of human individual differences, such as personality and general intelligence, has shown high stability of genetic influences (e.g., Briley & Tucker-Drob, 2014; Deary et al., 2012), with nonshared environmental influences (despite typically accounting for most

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of the variance at a given time), showing modest transmission across time (Briley & Tucker-Drob, 2014; Kandler et al., 2010). Such observations, however, have been almost entirely restricted to personality traits, leaving open the question of whether similar patterns exist for intergroup attitudes.

An environmental transmission account of the stability of intergroup attitudes would predict, in keeping with their predominating influence at each wave, that nonshared environment should account for the majority of phenotypic stability. This would be in line with theories in which the sources of intergroup attitudes are predicted to be environmental (e.g., Adorno, Frenkel-Brunswik, Levinson, & Sanford, 1950; Allport, 1954). It is also in keeping with research indicating that external events can lead to long-standing (i.e., multidecade) effects on intergroup attitudes (e.g., Voigtländer & Voth, 2015).

In contrast, the well-established observation of genetic influences on intergroup attitudes (e.g., Lewis & Bates, 2010, 2014), coupled with evidence for high levels of genetic stability and instability in nonshared environment effects for traits such as personality (Kandler et al., 2010) and even authoritarianism (Ludeke & Krueger, 2013), suggests that the temporal stability of favoritism should be mostly attributable to genetic factors. Correspondingly, nonshared environment effects would be expected to be mostly responsible for changes in favoritism.

To test which of these perspectives best describes the genetic and environmental etiology of in-group favoritism, we analyzed data from a nationally representative sample of noninstitutionalized, English-speaking adult twins, aged 25–74 years (Ryff et al., 2012). This adult sample of U.S. monozygotic and dizygotic twins were surveyed on a range of measures, including in-group favoritism in 1996 and again in 2006. Previous work has highlighted the existence of a general factor of favoritism and prejudice (i.e., those who tend to show preferences or derogation to one group tend to show more generalized sentiment of this kind; Allport, 1954). However, it is clear that more specific components of intergroup attitudes are deserving of attention in their own right (Akrami et al., 2011). As such, we examined a general measure of in-group favoritism that assessed race, ethnic, and religious favoritism as well as each of these domains of favoritism independently. As a reference point with which to compare our findings, we also report results of analyses performed on the Big Five personality traits measured on the same set of participants. These results are of additional interest because whereas the Big Five traits are theorized to reflect biologically rooted individual differences in samples of this age (e.g., McCrae & Costa, 2008), intergroup attitudes are typically conceived to be flexible and highly environmentally determined (Adorno et al., 1950; Brown, 2010).

Method

Participants

Phenotypic data were available for a sample of adult twin pairs (age range at Wave 1 [W1]: 25–75 years) contacted by the MacArthur Foundation Survey of Midlife Development (MIDUS) in the United States (Kendler, Thornton, Gilman, & Kessler, 2000; Kessler, Gilman, Thornton, & Kendler, 2004) at two waves: 1996 (W1) and 2006 (Wave 2 [W2]). At each time point, the pairs of twins were assessed for in-group favoritism and Big Five personality traits among other measures. Sample size at W1: 549 monozygotic individuals (224 complete pairs, 101 singletons: mean age = 44 years, SD = 12) and 796 dizygotic individuals (305 complete pairs, 186 singletons: mean age = 46 years, SD = 12). Sample size at W2: 415 monozygotic individuals (153 complete pairs, 109 singletons) and 608 dizygotic individuals (192 complete pairs, 226 singletons). Sample size was determined by the MIDUS data collection protocol and so was beyond our control. Formal power calculations are not readily available for such study designs, although simulation work has noted that for closely related designs (i.e., multivariate) and study parameters (e.g., moderate heritability, high correlations across phenotypes), the current sample size is well-powered (Schmitz, Cherny, & Fulker, 1998).

Measures

In-group favoritism was measured with 9 items assessing strength of in-group favoritism in three domains (race, ethnicity, and religion). In each of these domains, the degree of identification with the group, the preference for affiliating with in-group members, and the importance placed on marrying within the group were measured. Example items include, for instance, for racial identification "How closely do you identify with being a member of your racial group?" (1 = *not at all closely*, 4 = *very closely*). Items tapping race, ethnic, and religious favoritism were moderately to highly correlated within domain (.30 to .56, all $p < .001$; .37 to .63, all $p < .001$; and .54 to .63, all $p < .001$, respectively) and so these items were summed to create a composite score for each of these domains of in-group favoritism. These composites were, in turn, moderately correlated (.26–.35, all $p < .001$) and so a more general in-group favoritism composite was also constructed as the sum of the 9 items (Cronbach's α: W1 = .79; W2 = .79).

Big Five traits were measured using the Midlife Development Inventory, a self-administered 25-item personality questionnaire (Lachman & Weaver, 1997) with Big Five traits (agreeableness, conscientiousness, extraversion, neuroticism, and openness) scored as the mean score of the corresponding scale items (Cronbach's α: range = .73–.81, with the exception of conscientiousness: α = .55 and α = .54, for W1 and W2, respectively).

Analysis

Prior to conducting the biometric analyses, in line with standard practice, all variables were residualized for the effects of age and sex (McGue & Bouchard, 1984). Models were estimated using full-information maximum likelihood in OpenMx Version 2.2 (Boker et al., 2011; Neale et al., 2016) running
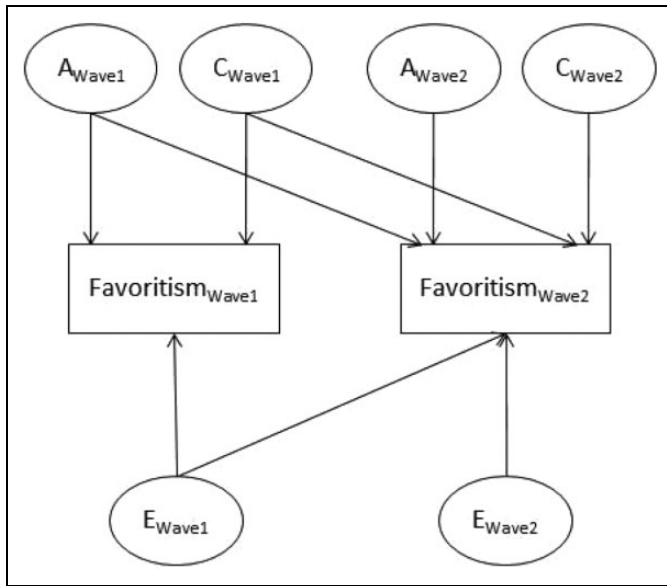
Figure 1. Example of the bivariate Cholesky decomposition for favoritism across Waves 1 and 2. A = additive genetic effects; C = shared environment effects; E = nonshared environment effects.

within R Version 3.2 (R Development Team, 2016). The classical twin design typically partitions observed variation into three components: additive genetic influences (A), shared environmental influences (C), and nonshared environmental influences (E). Genetic effects are inferred when monozygotic twins are more similar than dizygotic twins, whereas shared environment effects are inferred when monozygotic twin correlations are less than twice that of the dizygotic twins (Neale & Cardon, 1992). Nonshared environment effects are inferred when monozygotic twin correlations are less than at unity, and thus this variance component also includes measurement error.

To assess the degree to which genetic and environmental factors are stable over time requires an extension of the classical twin design to encompass repeated measurements. Here, we used the bivariate Cholesky decomposition approach (see Figure 1): For each of n measured variables, the Cholesky decomposition specifies n latent A, C, and E factors. Viewed as a diagram, with the latent factors arranged above the measured variables, each of these factors is connected to the measured (manifest) variable beneath it and to all variables to the right. In this way, each latent factor is connected to one fewer variables than the preceding factor. This design is of value for answering the current question as it allows estimation both of A, C, and E effects at W1, and the extent to which these can account for W2 variance, as well as the new variance that emerges at W2.

Results

Descriptive Statistics and Phenotypic Rank-Order Stability

Descriptive statistics and cross-sectional twin correlations are detailed in Table 1. The phenotypic rank-order stability for

Table 1. Descriptive Statistics and Cross-Sectional Twin Correlations for All Study Variables.

Measure	MZ				DZ				Correlations (r_{T1T2})			
	Mean$_{W1}$	SD$_{W1}$	Mean$_{W2}$	SD$_{W2}$	Mean$_{W1}$	SD$_{W1}$	Mean$_{W2}$	SD$_{W2}$	MZr$_{W1}$	DZr$_{W1}$	MZr$_{W1W2}$	DZr$_{W2}$
In-group favoritism	21.90	5.80	21.98	5.82	22.13	5.46	22.61	5.67	.52 [.43, .61]	.30 [.18, .41]	.58 [.48, .67]	.38 [.25, .51]
Race favoritism	8.77	2.50	8.11	2.48	8.70	2.44	8.38	2.43	.41 [.30, .51]	.16 [.04, .28]	.42 [.28, .55]	.32 [.17, .45]
Ethnic favoritism	5.90	2.41	6.25	2.55	6.00	2.37	6.56	2.52	.47 [.35, .58]	.23 [.12, .34]	.44 [.30, .58]	.25 [.10, .39]
Religious favoritism	7.37	2.77	7.49	2.82	7.53	2.67	7.66	2.71	.57 [.47, .66]	.34 [.22, .45]	.61 [.50, .70]	.29 [.14, .42]
Agreeableness	3.52	0.46	3.49	0.49	3.53	0.47	3.49	0.48	.34 [.25, .44]	.11 [.01, .20]	.41 [.25, .54]	.12 [−.01, .26]
Conscientiousness	3.45	0.44	3.52	0.40	3.43	0.43	3.48	0.44	.46 [.37, .55]	.19 [.09, .29]	.36 [.19, .50]	.17 [.04, .30]
Extraversion	3.22	0.56	3.12	0.55	3.22	0.55	3.12	0.58	.46 [.37, .55]	.13 [.03, .22]	.40 [.28, .52]	.17 [.01, .33]
Neuroticism	2.24	0.69	2.04	0.66	2.25	0.65	2.07	0.60	.53 [.44, .61]	.23 [.14, .32]	.49 [.34, .61]	.13 [−.03, .28]
Openness	2.99	0.51	2.89	0.52	2.95	0.54	2.85	0.54	.42 [.33, .52]	.23 [.14, .32]	.36 [.24, .48]	.16 [.02, .29]

Note. Confidence intervals (95%) are in square parentheses; MZ = monozygotic; DZ = dizygotic; W1/2 = Wave 1/2; T1/2 = twin 1/2; SD = standard deviation.

Table 2. Univariate Modeling Results From Wave 1 and Wave 2.

Measure	Wave 1			Wave 2		
	A	C	E	A	C	E
In-group favoritism	.36 [.09, .56]	.12 [.00, .34]	.52 [.44, .79]	.45 [.20, .62]	.08 [.00, .34]	.46 [.37, .58]
Race favoritism	.38 [.19, .46]	.00 [.00, .14]	.62 [.55, .71]	.25 [.00, .42]	.07 [.00, .30]	.67 [.58, .76]
Ethnic favoritism	.46 [.19, .55]	.00 [.00, .21]	.54 [.45, .62]	.38 [.08, .50]	.04 [.00, .52]	.58 [.49, .69]
Religious favoritism	.40 [.06, .61]	.17 [.00, .34]	.44 [.37, .50]	.58 [.33, .66]	.00 [.00, .21]	.42 [.35, .52]
Agreeableness	.26 [.10, .36]	.00 [.00, .11]	.74 [.64, .83]	.31 [.12, .42]	.00 [.00, .14]	.69 [.58, .81]
Conscientiousness	.42 [.32, .45]	.00 [.00, .14]	.58 [.52, .64]	.28 [.00, .48]	.07 [.00, .32]	.66 [.52, .81]
Extraversion	.42 [.29, .50]	.00 [.00, .09]	.58 [.50, .67]	.38 [.25, .50]	.00 [.00, .20]	.61 [.50, .71]
Neuroticism	.49 [.29, .56]	.00 [.00, .16]	.52 [.45, .59]	.40 [.21, .50]	.00 [.00, .14]	.61 [.50, .66]
Openness	.42 [.19, .52]	.01 [.00, .20]	.56 [.49, .66]	.35 [.06, .46]	.00 [.00, .21]	.66 [.55, .69]

Note. Confidence intervals (95%) are in square parentheses; estimates of A, C, and E reflect proportions of variance (i.e., .36 = 36% of phenotypic variance) and should sum to 1 notwithstanding rounding error. A = additive genetic effects; C = shared environment effects; E = nonshared environment effects.

each variable (derived from one twin in each pair drawn at random) was as follows: in-group favoritism: $r = .67$, confidence interval (CI) 95% = [.62, .72]; race favoritism: $r = .50$, CI 95% = [.41, .57]; ethnic favoritism: $r = .46$, CI 95% = [.36, .56]; religious favoritism: $r = .75$, CI 95% = [.69, .79]; agreeableness: $r = .67$, CI 95% = [.60, .73]; conscientiousness: $r = .62$, CI 95% = [.55, .67]; extraversion: $r = .72$, CI 95% = [.67, .76]; neuroticism: $r = .62$, CI 95% = [.56, .68]; and openness: $r = .69$, CI 95% = [.64, .74]. All measures thus showed a moderate to high level of stability across time.

Measurement Invariance

Although we used identical items across waves, it is important to test whether these items assess the same underlying construct at each wave and across age. This can be done using measurement invariance analyses; specifically, tests for configural and factorial measurement invariance. Configural invariance is achieved when models in which identical specification of latent factors and factor loadings across groups fit well. Factorial invariance is achieved when, in addition, the factor loadings can also be equalized across groups without significant loss of fit. To this end, we next examined the degree to which our measures of favoritism were configurally and factorially invariant across (i) waves and (ii) age-groups (here we performed a median split dividing our sample into <45 vs. 45+ years).

Configural invariance was observed in all cases, with absolute goodness of fit indices being universally excellent: all comparative fit index (CFI) = 1.0 and all root mean square error of approximation (RMSEA) = .00. Factorial invariance was observed in all cases (i.e., ΔCFI < .01, all ΔRMSEA $\leq$ .05), with the exception of race favoritism and general favoritism across waves. Here, we noted a significant χ^2 statistic, $\chi^2 = 8.83$, $df = 2$, $p = .01$; $\chi^2 = 8.67$, $df = 2$, $p = .01$, respectively. However, the χ^2 statistic is sensitive to sample size (Bentler & Bonnet, 1980), and our other fit indices were consistent with equivalence across groups. As such, overall we concluded that our constructs were both configurally and factorially invariant.

Univariate Twin Analyses

The univariate genetic and environmental influences on each trait are given in Table 2. In summary, all measures showed moderate-to-large additive genetic influences at each time (ranging from .26 to .58). No significant effects were observed for shared environment influences, although parameter estimates were suggestive for in-group and religious favoritism. The remainder of variance at each wave was attributable to nonshared environmental factors. Given the suggestion of a possible shared environment effect for in-group and religious favoritism, shared environment effects were included in all subsequent analyses so as not to bias or artificially inflate the estimate of genetic stability.

Longitudinal Twin Analyses

We next turn to the longitudinal twin analyses. We used a bivariate Cholesky approach to examine the magnitude of stability and change in genetic and environmental influences (see Figure 1 and Table 3).

Genetic and nonshared-environmental cross-time influences were significant for both in-group favoritism ($\Delta\chi^2 (1) = 15.72$, $p = 7.32 \times 10^{-5}$; $\Delta\chi^2 (1) = 48.74$, $p = 2.92 \times 10^{-12}$, respectively) and the Big Five traits (all $\Delta\chi^2 (1) > 10.91$, $p < 9.54 \times 10^{-3}$; all $\Delta\chi^2 (1) > 52.34$, $p < 4.66 \times 10^{-13}$, respectively). The same pattern was observed for race, ethnic, and religious favoritism: genetic ($\Delta\chi^2 (1) = 8.48$, $p = .004$; $\Delta\chi^2 (1) = 8.16$, $p = .004$; $\Delta\chi^2 (1) = 24.69$, $p = 6.75 \times 10^{-7}$, respectively) and nonshared-environmental ($\Delta\chi^2 (1) = 39.40$, $p = 3.46 \times 10^{-10}$; $\Delta\chi^2 (1) = 24.16$, $p = 8.87 \times 10^{-7}$; $\Delta\chi^2 (1) = 99.09$, $p = 2.41 \times 10^{-23}$, respectively) cross-time influences were significant in all cases. However, cross-time effects were substantially larger in all cases for genetic influences (see Table 4). Reflecting this asymmetry, the bulk of phenotypic stability was attributable to genetic factors ($\geq 60\%$), with a modest contribution arising from nonshared-environmental factors (12-40%; see Table 4). Notably, across all traits, in-group favoritism showed the lowest nonshared-environment contribution to stability at 12%, with the bulk (74%) of stable favoritism accounted for by

Table 3. Bivariate Cholesky Results.

Measure	Wave 1			Wave 2					
				Common With Wave 1			Unique at Wave 2		
	A	C	E	A	C	E	A	C	E
In-group favoritism	.41 [.21, .67]	.08 [.00, .40]	.52 [.45, .59]	.42 [.21, .71]	.08 [−.01, .41]	.07 [.03, .12]	.00 [−.96, .96]	.00 [−.22, .22]	.44 [.37, .50]
Race favoritism	.36 [.23, .52]	.02 [−.04, .23]	.62 [.55, .71]	.20 [.05, .45]	.06 [−.04, .48]	.06 [.03, .12]	.06 [−.01, .30]	.00 [−.35, .35]	.61 [.52, .71]
Ethnic favoritism	.38 [.19, .64]	.06 [−.02, .37]	.56 [.48, .66]	.21 [.06, .46]	.06 [−.02, .37]	.05 [.02, .10]	.12 [.04, .25]	.00 [−.12, .12]	.56 [.48, .66]
Religious favoritism	.44 [.26, .66]	.13 [.01, .36]	.44 [.37, .50]	.52 [.29, .81]	.04 [−.03, .29]	.10 [.06, .14]	.00 [−.38, .38]	.00 [−1.0, 1.0]	.35 [.29, .41]
Agreeableness	.26 [.17, .37]	.00 [−.35, .35]	.74 [.64, .85]	.26 [.14, .41]	.00 [−.19, .19]	.17 [.11, .24]	.07 [.01, .22]	.00 [−.18, .18]	.50 [.42, .59]
Conscientiousness	.45 [.36, .55]	.00 [−.12, .10]	.56 [.49, .64]	.35 [.18, .56]	.04 [−.01, .29]	.08 [.04, .14]	.00 [−.20, .20]	.00 [−1.0, 1.0]	.53 [.45, .62]
Extraversion	.42 [.34, .52]	.00 [−.13, .13]	.58 [.50, .66]	.37 [.26, .50]	.00 [−1.0, 1.0]	.16 [.10, .23]	.04 [.00, .16]	.00 [−1.0, 1.0]	.41 [.34, .49]
Neuroticism	.48 [.38, .58]	.00 [−1.0, 1.0]	.52 [.45, .59]	.37 [.27, .49]	.00 [−.30, .30]	.09 [.04, .15]	.02 [−.02, .21]	.00 [−.14, .14]	.52 [.44, .61]
Openness	.41 [.21, .67]	.02 [−.28, .67]	.58 [.49, .67]	.38 [.24, .56]	.01 [−.23, .44]	.14 [.09, .21]	.00 [−.76, .76]	.00 [−.28, .28]	.46 [.40, .53]

Note. Parameters are squared path estimates. 95% confidence intervals are in square parentheses. A = additive genetic effects; C = shared environment effects; E = nonshared environment effects.

genetic factors. Similar results were seen for race, ethnic, and religious favoritism. Full results from the bivariate Cholesky analyses are reported in Table 3.

Discussion

The current study sought to examine how genetic and environmental factors contribute to stability and change in favoritism across a 10-year period. A number of key findings were observed. Firstly, at the behavioral level, we observed a high degree of rank-order stability for in-group favoritism measures, whether at the general level, or for specific forms of favoritism (i.e., race, ethnicity, and religion; $r = .50–.76$ across the 10-year period). These behavioral results corroborate findings from earlier research (Krosnick, 1991; Wagner et al., 2008). Turning to the origins of stability, we found that most of this substantial stability across a 10-year period was accounted for by genetic factors, with three quarters of the stable phenotypic variance underpinning in-group favoritism being attributable to heritable influences. Finally, nonshared environmental factors accounted for most of the variance specific to a given wave, although a modest contribution to stability was also noted (12%). A broadly similar pattern was noted for race, ethnic, and religious favoritism: Genetic influences accounted for between two thirds and four fifths of the stable phenotypic variance in each case. Of note, for the Big Five traits, our observations replicated the reported levels of heritability, stability, and the sources of this stability reported in other samples (e.g., Briley & Tucker-Drob, 2014).

It was noteworthy that nonshared environment effects underpinning in-group favoritism (both at the general and the specific level) explained a similar proportion of the stable phenotypic variance as observed for Big Five traits. Thus, while it is commonly assumed that attitudes are likely to be more sensitive to environmental inputs than are basic temperaments and personality, this claim appears to be unfounded, at least in the context of stable, long-standing influences. Nonetheless, these results do not imply that interventions designed to ameliorate the effects of prejudice cannot be effective. Rather the opposite, as these findings confirm that attitudes are moderately malleable (phenotypic correlations are well below unity) and demonstrate that, to the extent attitudes are changeable, this malleability is almost entirely via nonshared environmental inputs. This suggestion should be caveated, however, with the knowledge that nonshared environment effects also contain measurement error and so the amount of change in favoritism attributed to this source of variance is likely to be an overestimate. Moreover, these changes in favoritism may be transient and so individuals may "revert to type" over time.

Our in-group favoritism constructs were observed to be configurally and factorially invariant over both wave and age (<45 vs. 45+ years), indicating that the same favoritism construct was assessed at both waves. This observation is valuable as it demonstrates that the factor structure of in-group favoritism—at least as assessed here—does not change over time or with respect to age-group, making interpretation of changes

Table 4. ACE Crosstime Stability (as a Percentage).

Measure	Phenotypic Stability (%)		
	A	C	E
In-group favoritism	74	14	12
Race favoritism	63	19	19
Ethnic favoritism	66	19	16
Religious favoritism	79	6	15
Agreeableness	60	0	40
Conscientiousness	74	9	17
Extraversion	70	0	30
Neuroticism	80	0	20
Openness	72	2	26

Note. A = additive genetic effects; C = shared environment effects; E = nonshared environment effects.

in these factor scores a valid index of change or difference in people's scores (rather than a change in the meaning of the construct itself over time). This is important because while one might expect, for example, that sentiment regarding marrying within the group plays a different role with respect to the favoritism construct across age (as one considers family legacy and so on), this was not supported by our data.

A number of limitations and recommendations for future work are noteworthy. Firstly, we measured only one form of intergroup attitude (in-group favoritism). Future work should address distinct forms of intergroup attitudes (for instance, out-group derogation and prejudice), as these have been shown to have distinct genetic and environmental influences (Lewis, Kandler, & Riemann, 2014). Secondly, the classical twin design is subject to specific assumptions, including equal environments across zygosity class and absence of assortative mating (Plomin, Defries, Knopik, & Neiderhiser, 2013). Future work using approaches such as the extended twin-family design (e.g., Truett et al., 1994) or polygenic risk scores (Okbay et al., 2016) with different sets of assumptions would provide convergent tests of the findings reported here. Thirdly, although nonshared environmental factors showed a modest degree of stability over time, the nature of the underlying processes driving these effects cannot be determined with the current data. One possibility is that experiences at or prior to W1 were substantial enough to have gotten "under the skin" and thus left a lasting psychological impression (e.g., Voigtländer & Voth, 2015). A second possibility is that those environmental factors that contributed to stable individual differences across W1 and W2 were those which were present for individuals at both waves, thus exerting the same proximal situational effects at both W1 and W2. These explanations are not mutually exclusive, but the relative contribution of each would be important to understand, as they directly address the mechanisms of stable nonshared environmental transmission. Future work utilizing longitudinal twin designs with well-specified measures of the environment will be required to determine which, if either of these models, is correct. Finally, as noted above, estimates of nonshared environment effects contain measurement error and so our cross-sectional results are potentially overestimates with regard to

this source of influence. This concern might also be thought to lead to an overestimate of nonshared environment effects with regard to phenotypic stability. This is less of a concern, however, as by definition measurement error will not be correlated over time. As such, the longitudinal nonshared environment effects will not be biased in this regard. Nonetheless, study designs that can explicitly account for measurement error—such as the biometric latent growth curve model (Bleidorn, Kandler, Riemann, Angleitner, & Spinath, 2009; Hopwood et al., 2011)—are recommended for use in future work of this kind.

In summary, we observed that in-group favoritism—both in general terms and at the level of race, ethnicity, and religion—is highly stable across a 10-year period in adulthood. Moreover, this stability was largely attributable to genetic factors, with a modest contribution to stability stemming from nonshared environmental factors. These findings diverge from observations reported in cross-sectional studies of in-group favoritism that stress roughly equal contributions from genetics and nonshared environments and highlight that genetic factors serve to shape our stable attitudes toward the in-group whereas environmental factors contribute mostly to change in such attitudes.

Declaration of Conflicting Interests

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