

Research Article

ALTRUISM AND ANTISOCIAL BEHAVIOR: Independent Tendencies, Unique Personality Correlates, Distinct Etiologies

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Abstract—*The relationship between altruism and antisocial behavior has received limited attention because altruism and antisocial behavior tend to be studied and discussed in distinct literatures. Our research bridges these literatures by focusing on three fundamental questions. First, are altruism and antisocial behavior opposite ends of a single dimension, or can they coexist in the same individual? Second, do altruism and antisocial behavior have the same or distinct etiologies? Third, do they stem from the same or from distinct aspects of a person's personality? Our findings indicate that altruism and antisocial behavior are uncorrelated tendencies stemming from different sources. Whereas altruism was linked primarily to shared (i.e., familial) environments, unique (i.e., nonfamilial) environments, and personality traits reflecting positive emotionality, antisocial behavior was linked primarily to genes, unique environments, and personality traits reflecting negative emotionality and a lack of constraint.*

Psychology is in the midst of a renaissance of interest in personality. Owing directly to this renewed interest, Krueger and his colleagues have pursued systematic research on links between personality traits and maladaptive social behaviors in population-based samples (e.g., Krueger, 1999; Krueger, Caspi, Moffitt, Silva, & McGee, 1996; Krueger et al., 1994). Krueger, Caspi, and Moffitt (2000) recently coined the term “epidemiological personology” to describe this approach.

To date, research in epidemiological personology has focused solely on distress and dysfunction. Understanding distress and dysfunction is an important goal, as maladaptive social behavior is costly to society. But by focusing solely on maladaptive social behavior, researchers may be neglecting key elements of psychology's original mission. As noted recently by Seligman and Csikszentmihalyi (2000), “Psychology is not just the study of pathology, weakness, and damage; it is also the study of strength and virtue” (p. 7). We hypothesized that epidemiological personology could contribute to this effort to rejuvenate the study of strength and virtue, and hence, we undertook research to extend our paradigm to the study of prosocial behavior. Specifically, we sought to compare and contrast a specific form of prosocial behavior, altruism, with its logical counterpart from our prior investigations, antisocial behavior (see Krueger et al., 1994). We pursued research directed at answering three fundamental questions about relations among altruism, antisocial behavior, and personality traits.

First, are altruism and antisocial behavior opposite ends of a single dimension, or can altruistic and antisocial tendencies coexist in the same individual? Altruism is typically conceptualized as a component of the broader construct of prosocial behavior, and the term “prosocial” entered the social science literature to define the opposite of anti-

social behavior (Batson, 1998; Wispe, 1972). This terminology suggests that altruism and antisocial behavior should define opposite ends of a single dimension. Nevertheless, this possibility has received limited empirical attention because research on antisocial behavior and research on prosocial behavior tend to form two distinct literatures. Antisocial behavior is typically studied by criminologists and psychopathologists, whereas altruism is typically studied by social psychologists. Although a few studies have bridged these literatures, findings from these studies are inconsistent, with some suggesting that pro- and antisocial tendencies are opposite ends of a single trait (e.g., Eron & Huesmann, 1984; Goma-i-Freixanet, 1995), and others suggesting that these domains contain substantial amounts of nonoverlapping variance (e.g., Axelrod, Widiger, Trull, & Corbitt, 1997; Harris, Rushton, Hampson, & Jackson, 1996; Levenson, 1990; McCord, 1992; Rushton, Fulker, Neale, Nias, & Eysenck, 1986, 1989). Moreover, existing studies mix measures of behavior with measures of attitudes and reputation, leaving the question of the correlation between altruistic and antisocial behavior per se unanswered. In the study we report here, we directly estimated the correlation between altruistic and antisocial behavioral tendencies by measuring these propensities using comparably reliable self-report inventories that inquired specifically about the frequency of altruistic and antisocial behaviors, as opposed to attitudes or reputation.

Second, are altruism and antisocial behavior linked to personality, and do they stem from the same or from distinctive aspects of a person's personality? As recently as 1990, a review of the field of altruism research concluded that “it is undoubtedly futile to search for the altruistic personality,” citing “inconsistent relationships between personality characteristics and prosocial behavior” (Piliavin & Charng, 1990, p. 31). Interestingly, before the 1990s, criminologists also dismissed personality as an unfruitful area of inquiry (see Stitt & Giacomassi, 1992). Fortunately, these viewpoints have undergone marked change in recent years. Recent reviews of the altruism literature have noted that theoretical models of altruism that do not take dispositional factors into account are likely to be incomplete (Batson, 1998; Schroder, Penner, Dovidio, & Piliavin, 1995). In addition, empirical research has begun to demonstrate systematic and meaningful links between personality and antisocial behavior (Elkins, Iacono, Doyle, & McGue, 1997; Krueger et al., 1994).

A question that remains to be explored, however, is whether a structural model of personality traits can help to explain the relation (or lack thereof) between altruism and antisocial behavior. A structural model of personality is a formal account of patterns of correlations among basic personality traits in terms of a smaller number of “supertraits,” or higher-order personality factors. These higher-order factors provide a “road map” of the major axes of human variation, and a structural model of personality therefore provides the theoretical basis needed to understand patterns of relations among various behavioral propensities. For example, in our research to date, we have employed the structural model of personality traits developed by Tellegen (1985). In Tellegen's system, basic personality traits can be organized

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around three fundamental and relatively independent super-traits: positive emotionality (a tendency to experience positive emotions linked to active engagement with social and work environments), negative emotionality (a tendency to experience unpleasant emotions such as anxiety and anger), and constraint (a tendency to endorse social norms, act in a cautious manner, and avoid thrills). These three structures reflect the organization of personality not only at the phenotypic level, but also at the level of both genetic and environmental effects (Krueger, 2000). In addition, we have found this system to have excellent utility in explaining correlations among maladaptive behavior patterns, with negative emotionality being linked to maladjustment generally, but constraint determining the form maladjustment takes. Specifically, if negative emotionality is paired with low constraint, maladjustment is expressed outward, in the form of problems such as antisocial behavior (vs. inward as anxiety and depression, in the absence of low constraint; Krueger, 1999; Krueger et al., 1996, 2000).

Positive emotionality, in contrast, has shown few robust correlations with maladaptive behavior in our research. Are there no robust behavioral correlates of positive emotionality, or have we been looking in the wrong places? The research we report here addressed the latter possibility—that by focusing exclusively on maladaptive behavior, we have neglected the behavioral correlates of positive emotionality. Keeping in mind that positive emotionality, negative emotionality, and constraint are relatively independent, this hypothesis implies that adaptive and maladaptive behavioral tendencies might be uncorrelated. More specifically, we hypothesized that altruism would be linked to the positive emotionality superfactor (cf. Graziano & Eisenberg, 1997), but that (as in our past research) antisocial behavior would be linked to high negative emotionality and low constraint. This pattern of correlations, in turn, suggests that altruism and antisocial behavior should be uncorrelated, independent tendencies because they are linked to distinctive, uncorrelated aspects of personality. In the current research, we were able to test this hypothesis because participants completed a personality instrument that measures Tellegen's superfactors (the Multidimensional Personality Questionnaire, MPQ; Tellegen, 2000), in addition to the aforementioned indices of altruistic and antisocial behavior.

Our third question was, do altruistic and antisocial behavior have the same or distinct etiologies? A powerful means of investigating the etiology of individual differences in behavior involves studying genetically informative samples, such as samples of twins. Nevertheless, in the behavior genetic literature, antisocial behavior has received far greater attention than altruistic behavior. Much is now known about the genetic and environmental roots of antisocial behavior in adulthood; recent, well-designed studies reveal a significant genetic contribution to antisocial behavior in adults, as well as a significant contribution of the nonshared environment (environmental effects that make people growing up in the same families different; Bock & Goode, 1996; Carey & Goldman, 1997; DiLalla & Gottesman, 1989; Gottesman & Goldsmith, 1994; Lyons et al., 1995; Rutter, 1997; van den Bree, Svikis, & Pickens, 1998). However, much less is known about the genetic and environmental roots of altruism; we are aware of only one genetically informative study focused specifically on altruistic behavior in adults (Rushton et al., 1986). Yet there are reasons to believe that behavior genetic studies may be as informative about altruistic behavior as they have been about antisocial behavior and, moreover, that such studies may reveal altruism to be etiologically distinct from antisocial behavior. Specifically, little variance in most behavioral traits can be traced to shared environments (environmental

effects that make people growing up in the same families similar; Rowe, 1994). One possible exception to this basic finding, however, involves positive traits and behaviors (Plomin & Caspi, 1999). Attitudes toward love and romance (Waller & Shaver, 1994), agreeableness (Bergeman et al., 1993; Riemann, Angleitner, & Strelau, 1997), and extraversion (Beer, Arnold, & Loehlin, 1998) in adults, as well as positive affect in children (Goldsmith, Buss, & Lemery, 1997), have shown significant shared environmental variance. On the basis of this evidence, we hypothesized that altruistic and antisocial behavior would be etiologically distinct, with altruism showing a notably larger shared environmental component of variance than antisocial behavior. To evaluate this possibility, we conducted our research in a sample of twins.

METHOD

Research Participants

Data for this report were obtained from mailings to male twins born between 1961 and 1964. These twins make up the youngest cohort enrolled in the Minnesota Twin Registry (MTR). MTR members were ascertained from birth records provided by the Minnesota State Health Department. Surviving intact twin pairs were located and recruited by mail, and initial mailings included five questions about twin similarity that were used to determine zygosity (monozygotic, or MZ, vs. dizygotic, or DZ). This method achieves 95% accuracy when compared with zygosity established via blood samples (Lykken, Bouchard, McGue, & Tellegen, 1990). Measures for this report and informed consent were obtained from 170 MZ pairs, 106 DZ pairs, and 121 individuals whose twin did not participate. These 673 persons were 33 years old on average when they completed our measures. To correct for the nonindependence of observations stemming from complete twin pairs, individuals from complete twin pairs were assigned weights of 1/2 in our phenotypic analyses to reflect the number of independent observations in the analyses, resulting in a weighted *N* of 397 (cf. McGue, Bacon, & Lykken, 1993).

Measurement of Personality

Participants completed the 198-item version of the MPQ (Tellegen, 2000). The 11 primary MPQ scales have excellent internal-consistency reliabilities (alphas in the MTR range from .77 to .88) and cohere in a three-factor, higher-order structure consisting of orthogonal dimensions labeled positive emotionality, negative emotionality, and constraint (Krueger 2000; Tellegen, 1985). Positive emotionality is indicated primarily by Well-Being, Social Potency, Social Closeness, Achievement, and Absorption. Negative emotionality is indicated primarily by Stress Reaction, Alienation, and Aggression. Constraint is indicated primarily by Control, Harmavoidance, and Traditionalism.

Measurement of Antisocial Behavior

Antisocial behavior was measured using a self-report questionnaire consisting of items drawn primarily from the Short-Nye Self-Report Delinquency Items and the Seattle Self-Report Instrument (see Hindelang, Hirschi, & Weis, 1981, Appendices A and B), as well as from the Clark Self-Report List of Deviant Behavior (Clark & Tiff, 1966). Self-report indices of antisocial behavior are commonly employed in criminological research because they are often less biased than indices

that reflect only crime detected by authorities (such as conviction records). Nevertheless, such indices also show good convergent validity with other indices of antisocial behavior, such as the reports of peers and officials (e.g., Krueger et al., 1994).

Items that ask for the frequency of each antisocial behavior (4-point scale, from *never* to *very often*) after high school graduation (or age 17) were used for this report. These items fall into four broad content classes, and span a range of common and rare behaviors and a range of seriousness. They inquire about theft (e.g., "How often did you take something not belonging to you worth more than \$50?"), illegal behavior involving drugs and alcohol (e.g., "How many times did you sell marijuana or some other illegal drug?"), force (e.g., "How often did you take part in fights in which a group of your friends was against another group?"), and miscellaneous vice (e.g., "How many traffic citations, other than for parking, did you receive?"). The reliability of our self-reported adult antisocial behavior index was good ($\alpha = .89$, 27 items). Because total scores on the index were positively skewed, these scores were log-transformed prior to being analyzed.

Measurement of Altruism

Altruism was measured using a self-report questionnaire consisting of items adapted from the Self-Report Altruism Scale of Rushton, Chrisjohn, and Fekken (1981), plus additional items added to expand upon the range and scope of altruistic actions. Specifically, the Self-Report Altruism Scale inquires primarily about altruistic actions taken toward strangers, or intended to benefit organizations, and our items expanded upon these areas, as well as inquiring about actions intended to benefit friends and acquaintances. Thus, the 45 items on our questionnaire fell into four broad content classes, inquiring about the frequency of altruistic behavior (4-point scale, from *never* to *often*) toward friends (e.g., "I have done chores or shopping for one or more close friends who were sick"), acquaintances (e.g., "I have offered to give a ride to one or more acquaintances even though it meant going out of my way"), strangers (e.g., "I have stopped to help a stranger who was having difficulty carrying their belongings"), and organizations (e.g., "I have done volunteer work for a charity or community service organization"). The reliability of this scale in our sample was good ($\alpha = .90$).

RESULTS AND DISCUSSION

Altruism and Antisocial Behavior: Correlated or Independent?

Were altruism and antisocial behavior correlated or independent tendencies in our data? The Pearson product-moment correlation between our altruism and antisocial behavior scales was $-.08$, n.s. This correlation suggests that altruism and antisocial behavior were largely independent in our data. Nevertheless, two forms of error can reduce the magnitude of observed correlations, potentially leading to underestimates of actual correlations: acquiescence (a systematic tendency to respond "true" to diverse items, regardless of item content) and random measurement error. Hence, we pursued analyses to ensure that these artifacts were not responsible for the low magnitude of the correlation we observed.

First, we used Tellegen's (2000) TRIN (true-response inconsistency) scale to measure acquiescence, and we examined the correlation between altruism and antisocial behavior, controlling for TRIN.

TRIN consists of 23 pairs of MPQ items that are opposite in content, and is scored as the sum of responses to these items, with no items reflected (i.e., all items scored true). Hence, high scores on TRIN represent the tendency to answer "true" regardless of item content. The partial correlation between altruism and antisocial behavior controlling for TRIN was $-.08$, n.s. Thus, in our data, the nonsignificant correlation between altruism and antisocial behavior was not due to an acquiescent response set.

Second, we estimated the latent correlation between altruism and antisocial behavior, taking into account random measurement error, by using a confirmatory factor analytic model. Specifically, for this analysis, we divided the items in our altruism and antisocial behavior inventories rationally into facets, or groups of items, based on their manifest content. The antisocial behavior items were divided into four groups, theft (6 items), drug-alcohol (3 items), force (6 items), and vice (12 items). As these facets were positively skewed, we treated the theft, drug-alcohol, and force variables as ordinal and log-transformed vice prior to estimating correlations among the variables. The altruism items were also divided into four groups, friends (7 items), acquaintances (9 items), strangers (16 items), and organizations (13 items), which were treated as continuous because they showed no marked skew.

Product-moment (for pairs of continuous variables), polychoric (for pairs of ordinal variables), and polyserial (for pairings between ordinal and continuous variables) correlations were computed among the variables using the computer program PRELIS 2.3 (Jöreskog & Sörbom, 1996b), and may be seen in Table 1. Using the computer program LISREL 8.3 (Jöreskog & Sörbom, 1996a), we fit a weighted least-squares confirmatory factor analytic model to these correlations. In this model, the altruism facets were allowed to load freely on a latent Altruism factor, the antisocial facets were allowed to load freely on a latent Antisocial factor, the correlation between these latent factors was also free to vary, and identification was achieved by fixing the variances of the latent factors at 1.0. This model fit the data sufficiently, $\chi^2(19, N = 397) = 37.65, p = .01, RMSEA = .05$. As can be seen in Table 1, all variables showed notable standardized loadings on their target factors; each of these loadings was significant at $p < .05$. The latent correlation between antisocial behavior and altruism in this model was estimated at $-.12$, which was not significant ($z = -1.37$). In sum, a straightforward zero-order correlational approach, a correlational approach controlling for acquiescence, and a more elaborate confirmatory factor analytic approach all converged on the conclusion that altruism and antisocial behavior were largely independent behavioral tendencies in our data.

Biometry of Altruism and Antisocial Behavior

Given evidence that altruism and antisocial behavior were independent tendencies in our data, we sought to determine if the variance in these tendencies might be linked to different sources. Specifically, data from twins allows resolution of the sources of variance in behavioral phenotypes into three categories: additive genetic variance (labeled A); shared, or "common," environmental variance (labeled C); and nonshared environmental variance (labeled E). Our goal was to find the maximum-likelihood model that best explained the observed data while invoking as few unknown parameters as possible (i.e., the model that achieved the smallest chi-square while allowing the largest number of degrees of freedom). We therefore evaluated model fit using Akaike's Information Criterion (AIC; Akaike, 1987), calculated as

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Table 1. Correlations among facets of altruism and antisocial behavior and factor loadings for a two-factor model of altruism and antisocial behavior

Facet	Correlations								Loadings	
	1	2	3	4	5	6	7	8	Altruism	Antisocial behavior
1. Altruism-strangers	1.00								.85	—
2. Altruism-acquaintances	.63	1.00							.80	—
3. Altruism-friends	.64	.67	1.00						.81	—
4. Altruism-organizations	.61	.46	.51	1.00					.69	—
5. Antisocial-force	.00	.12	.09	-.13	1.00				—	.77
6. Antisocial-drug	-.12	-.03	.02	-.17	.37	1.00			—	.65
7. Antisocial-theft	-.04	.03	.06	-.17	.48	.45	1.00		—	.79
8. Antisocial-vice	-.09	.04	.05	-.15	.61	.48	.61	1.00	—	.70

Note. Numbers listed under “Correlations” refer to facets, the names of which are given on the left side of the table. In the “Loadings” columns, cells marked with “—” refer to loadings fixed at zero in the confirmatory factor model.

$\chi^2 - (2 \times df)$, seeking the model with the largest negative AIC value. We fit four models to the altruism and antisocial variables using the computer program MX (Neale, 1997): a model that included all three components of variance (additive genes, shared environments, and nonshared environments, referred to as an ACE model), a model that dropped C (AE), a model that dropped A (CE), and a model that dropped both A and C (E).

Results from fitting these models may be seen in Table 2. For antisocial behavior (MZ cross-twin correlation = .51; DZ correlation = .28), the best-fitting model was the AE model, whereas for altruism (MZ correlation = .38; DZ correlation = .31), the best-fitting model was the CE model. In the AE model of antisocial behavior, the standardized maximum-likelihood estimate of A was 52% (95% likelihood-based confidence interval: 41%–62%), and the standardized maximum-likelihood estimate of E was 48% (38%–59%). In the CE model of altruism, C was estimated at 35% (25%–45%) and E was estimated at 65% (55%–75%). To summarize, individual differences in antisocial behavior were linked to genes and nonshared environments,

whereas individual differences in altruism were linked to shared and nonshared environments.

Linking Altruism and Antisocial Behavior to Personality Traits

In our data, altruism and antisocial behavior were largely uncorrelated tendencies with distinct etiologies; were they also linked with distinct personality traits? Correlations between (a) the MPQ scales and superfactors and (b) altruism and antisocial behavior are presented in Table 3. The table shows a consistent pattern of relations, in which positive emotionality and its component scales are correlated with altruism, but other personality traits—negative emotionality and a lack of constraint—are correlated with antisocial behavior.

To ensure that these correlations were not inflated because of content overlap between our altruism or antisocial behavior measure and the MPQ, we examined each item on the altruism and antisocial behavior measures for possible overlap with the MPQ items. We found six MPQ items with content that partially overlapped with the antisocial behavior measure; no MPQ items overlapped with the altruism measure. Each of these six MPQ items inquires about physically violent actions (e.g., “Sometimes I just like to hit someone”), and all six items are scored on the Aggression subscale. Hence, we reconstructed this subscale, eliminating these six items, and recomputed the correlation between aggression and antisocial behavior. The recomputed correlation was .37, $p < .01$ (vs. the original correlation of .39). In sum, content overlap could not explain the correlations we found linking personality to altruism and antisocial behavior.

Finally, to assess the overall magnitude of relations between personality and altruism and antisocial behavior, we estimated ordinary least-squares multiple regressions in which all 11 MPQ scales were entered simultaneously as predictors of altruism and antisocial behavior. As shown in the last row of Table 3, both multiple correlations were sizable (.50 and .47, respectively). In addition, examination of the standardized regression coefficients (betas) from these regressions suggested that at the level of unique effects of the MPQ scales, Social Potency, Social Closeness, Absorption, and a lack of Aggression were associated with altruism, whereas Aggression, a lack of Control, and a lack of Harmavoidance were associated with antisocial behavior. Thus,

Table 2. Results from four biometric models fit to twin data on altruism and antisocial behavior

Variable	Model			
	ACE (3)	AE (4)	CE (4)	E (5)
Altruism				
χ^2	1.52	3.15	1.99	38.88
AIC	-4.48	-4.85	-6.01	28.88
Antisocial behavior				
χ^2	1.77	1.79	8.63	60.93
AIC	-4.23	-6.21	0.63	50.93

Note. Numbers in parentheses after the model labels show the degrees of freedom associated with each model. A = additive genetic variance; C = shared environmental variance; E = nonshared environmental variance; AIC = Akaike’s Information Criterion.

Table 3. Indices of association between Multidimensional Personality Questionnaire (MPQ) scales and superfactors and altruism and antisocial behavior

MPQ	Behavior			
	Altruism		Antisocial behavior	
	<i>r</i>	β	<i>r</i>	β
Scales				
Well-Being	.30*	.05	.03	.08
Social Potency	.30*	.17*	.11	.00
Achievement	.25*	.11	.04	.03
Social Closeness	.29*	.18*	-.03	.03
Absorption	.23*	.20*	.16*	.03
Stress Reaction	-.10	.02	.15*	.02
Alienation	-.12	.00	.22*	.04
Aggression	-.21*	-.21*	.39*	.31*
Control	.08	.00	-.26*	-.15*
Harmavoidance	-.09	-.06	-.24*	-.15*
Traditionalism	.10	.07	-.06	.00
Superfactors				
Positive Emotionality	.44*		.11	
Negative Emotionality	-.10		.28*	
Constraint	.07		-.27*	
Multiple correlation	.50*		.47*	

Note. Multiple correlations and beta weights are from ordinary least-squares regressions predicting altruism and antisocial behavior from all 11 MPQ scales.

* $p < .01$.

both altruism and antisocial behavior were strongly and meaningfully associated with distinctive personality traits.

SUMMARY AND CONCLUSION

Our analyses indicate that altruism and antisocial behavior are independent tendencies with unique personality correlates and distinct etiologies. Nevertheless, some limitations must be borne in mind when considering these findings. First, our findings are limited to men; future research must determine the generality of these findings across genders. Also, although our sample was drawn from a broad population (male twins born in Minnesota in the early 1960s), this population is not as broad as, for example, the U.S. population. It would be valuable to examine the generality of our findings in other samples, drawn from other broad and well-defined populations.

Second, our findings are limited to self-report. Analyses employing other indices of altruistic and antisocial behavior (e.g., records of tax deductions resulting from charitable contributions, arrest records) could provide a very informative extension of the work presented here. Third, our data are contemporaneous rather than predictive. In future work, it would be valuable to determine the ways in which personality traits and altruistic and antisocial actions interact and influence each other across time and across other developmental periods. For example, would our findings generalize to adolescence, when antisocial behavior is at its peak (Moffitt, 1993), or to later adulthood, when generativity (prosocial behavior intended to benefit the next generation) becomes important (McAdams & de St. Aubin, 1998)?

Fourth, our findings are limited to a specific, behavioral operationalization of the altruism construct, which may be one facet of a broader prosocial orientation encompassing affective and cognitive propensities in addition to behavioral ones. Along these lines, Penner, Fritzsche, Craiger, and Freifeld (1995) gathered measures predictive of prosocial tendencies and found two correlated facets underlying these measures. The first facet, "other-oriented empathy," is indicated more by thoughts and feelings of concern for others' welfare, whereas the second facet, "helpfulness," is indicated more by reports of past prosocial actions. As our measure of altruism is closer to the second of these two facets, future research could extend the efforts reported here by studying personality, antisocial behavior, and both of the facets found by Penner et al. in a genetically informative sample.

Despite these limitations, our findings answer some fundamental questions about altruism and antisocial behavior, and they emphasize the relevance of both genetically informative studies and structural models of personality in understanding the psychological bases and origins of behavioral tendencies. Altruism and antisocial behavior were independent tendencies in our data. This finding, although potentially counterintuitive from a terminological perspective (i.e., the tendency to use the term "prosocial behavior" as an antonym for "antisocial behavior"; Batson, 1998; Wispe, 1972), makes sense in light of our additional analyses. Specifically, altruism and antisocial behavior were etiologically distinct; altruism in our sample arose from environmental factors (both shared and nonshared), but antisocial behavior arose from genes and nonshared environments. Although behavior genetic designs have produced a large database attesting to the relative unimportance of shared family environments in shaping many adult phenotypes (Rowe, 1994), altruism—and perhaps prosocial and positive behaviors more generally—may provide an important exception. Perhaps altruistic behavior in adulthood shows greater shared environmental influence than antisocial behavior because altruistic behaviors stem more from cultural experiences that are shared by members of the same families and that directly promote altruistic behavior. Church affiliation, for example, is substantially influenced by the shared environment (D'Onofrio, Eaves, Murrelle, Maes, & Spilka, 1999), and might contribute directly to frequency of altruistic behavior.

Although further research is needed to replicate and extend our findings to additional positive phenotypes, our finding of distinct etiologies for altruistic and antisocial behavior could have broad implications. If the sources of desirable and undesirable behaviors are distinct, strategies designed to diminish undesirable behavior need not result in the promotion of desirable behavior, and vice versa. Moreover, researchers' tendency to focus on undesirable behavior appears to result in an incomplete picture of human functioning; desirable and undesirable qualities can coexist in the same persons, and conceptual models and assessment approaches need to be broadened to reflect this fact (Seligman & Csikszentmihalyi, 2000).

The finding of a distinction between the personological sources of altruism (positive emotionality) and antisocial behavior (unconstrained negative emotionality) also helps to explain the independence of these tendencies. This finding explains why we have encountered only sporadic relations between positive emotionality and behavior in our work to date (Krueger et al., 2000); it is not that positive emotionality lacks behavioral correlates, but instead that these correlates entail adaptive social behaviors, and we have been studying only maladaptive behaviors. Note also that specific personality traits had only modest validity as predictors of behavioral tendencies (cf. Ahadi & Diener, 1989), but in aggregate, personality was substantially related

to behavior. Yet the goal of the personologist is not just prediction, but also psychological understanding, and our findings emphasize the ways in which a structural model of personality provides both. The most general implication of this work is that it underlines the utility of combining an epidemiological sampling strategy with the conceptual and methodological tools of personality and differential psychology in investigating socially relevant behavioral propensities.

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REFERENCES

- Ahadi, S., & Diener, E. (1989). Multiple determinants and effect size. *Journal of Personality and Social Psychology, 56*, 398–406.
- Akaike, H. (1987). Factor analysis and AIC. *Psychometrika, 52*, 317–332.
- Axelrod, S.R., Widiger, T.A., Trull, T.J., & Corbitt, E.M. (1997). Relations of five-factor model antagonism facets with personality disorder symptomatology. *Journal of Personality Assessment, 69*, 297–313.
- Batson, C.D. (1998). Altruism and prosocial behavior. In D.T. Gilbert & S.T. Fiske (Eds.), *Handbook of social psychology* (pp. 282–316). Boston: McGraw-Hill.
- Beer, J.M., Arnold, R.D., & Loehlin, J.C. (1998). Genetic and environmental influences on MMPI factor scales: Joint model fitting to twin and adoption data. *Journal of Personality and Social Psychology, 74*, 818–827.
- Bergeman, C.S., Chipuer, H.M., Plomin, R., Pedersen, N.L., McClearn, G.E., Nesselroade, J.R., Costa, P.T., Jr., & McCrae, R.R. (1993). Genetic and environmental effects on openness to experience, agreeableness, and conscientiousness: An adoption/twin study. *Journal of Personality, 61*, 159–179.
- Bock, G.R., & Goode, J.A. (Eds.). (1996). *Genetics of criminal and antisocial behavior*. New York: Wiley.
- Carey, G., & Goldman, D. (1997). The genetics of antisocial behavior. In D.M. Stoff & J. Breiling (Eds.), *Handbook of antisocial behavior* (pp. 243–254). New York: John Wiley & Sons.
- Clark, J.P., & Tiff, L.L. (1966). Polygraph and interview validation of self-reported deviant behavior. *American Sociological Review, 31*, 516–523.
- DiLalla, L.F., & Gottesman, I.I. (1989). Heterogeneity of causes for delinquency and criminality: Lifespan perspectives. *Development and Psychopathology, 1*, 339–349.
- D'Onofrio, B.M., Eaves, L.J., Murrelle, L., Maes, H.H., & Spilka, B. (1999). Understanding biological and social influences on religious affiliation, attitudes, and behaviors: A behavior genetic perspective. *Journal of Personality, 67*, 953–984.
- Elkins, I.J., Iacono, W.G., Doyle, A.E., & McGue, M. (1997). Characteristics associated with the persistence of antisocial behavior: Results from recent longitudinal research. *Aggression and Violent Behavior, 2*, 101–124.
- Eron, L.D., & Huesmann, L.R. (1984). The relation of prosocial behavior to the development of aggression and psychopathology. *Aggressive Behavior, 10*, 201–211.
- Goldsmith, H.H., Buss, K.A., & Lemery, K.S. (1997). Toddler and childhood temperament: Expanded content, stronger genetic evidence, new evidence for the importance of environment. *Developmental Psychology, 33*, 891–905.
- Goma-i-Freixanet, M. (1995). Prosocial and antisocial aspects of personality. *Personality and Individual Differences, 19*, 125–134.
- Gottesman, I.I., & Goldsmith, H.H. (1994). Developmental psychopathology of antisocial behavior: Inserting genes into its ontogenesis and epigenesis. In C.A. Nelson (Ed.), *The Minnesota Symposia on Child Psychology: Vol. 27. Threats to optimal development: Integrating biological, psychological, and social risk factors* (pp. 69–104). Hillsdale, NJ: Erlbaum.
- Graziano, W.G., & Eisenberg, N. (1997). Agreeableness: A dimension of personality. In R. Hogan, J. Johnson, & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 795–824). New York: Academic Press.
- Harris, J.A., Rushton, J.P., Hampson, E., & Jackson, D.N. (1996). Salivary testosterone and self-report aggressive and pro-social personality characteristics in men and women. *Aggressive Behavior, 22*, 321–331.
- Hindelang, M.J., Hirschi, T., & Weis, J.G. (1981). *Measuring delinquency*. Beverly Hills, CA: Sage.
- Jöreskog, K., & Sörbom, D. (1996a). *LISREL 8: User's reference guide*. Chicago: Scientific Software International.
- Jöreskog, K., & Sörbom, D. (1996b). *PRELIS 2: User's reference guide*. Chicago: Scientific Software International.
- Krueger, R.F. (1999). Personality traits in late adolescence predict mental disorders in early adulthood: A prospective-epidemiological study. *Journal of Personality, 67*, 39–65.
- Krueger, R.F. (2000). Phenotypic, genetic, and nonshared environmental parallels in the structure of personality: A view from the Multidimensional Personality Questionnaire. *Journal of Personality and Social Psychology, 79*, 1057–1067.
- Krueger, R.F., Caspi, A., & Moffitt, T.E. (2000). Epidemiological personality: The unifying role of personality in population-based research on problem behaviors. *Journal of Personality, 68*, 967–998.
- Krueger, R.F., Caspi, A., Moffitt, T.E., Silva, P.A., & McGee, R. (1996). Personality traits are differentially linked to mental disorders: A multitrait—multi-diagnosis study of an adolescent birth cohort. *Journal of Abnormal Psychology, 105*, 299–312.
- Krueger, R.F., Schmutte, P.S., Caspi, A., Moffitt, T.E., Campbell, K., & Silva, P.A. (1994). Personality traits are linked to crime among men and women: Evidence from a birth cohort. *Journal of Abnormal Psychology, 103*, 328–338.
- Levenson, M.R. (1990). Risk taking and personality. *Journal of Personality and Social Psychology, 58*, 1073–1080.
- Lykken, D.T., Bouchard, T.J., Jr., McGue, M., & Tellegen, A. (1990). The Minnesota Twin Family Registry: Some initial findings. *Acta Geneticae Medicae et Gemellologicae, 39*, 35–70.
- Lyons, M.J., True, W.R., Eisen, S.A., Goldberg, J., Meyer, J.M., Faraone, S.V., Eaves, L.J., & Tsuang, M. (1995). Differential heritability of adult and juvenile antisocial traits. *Archives of General Psychiatry, 52*, 906–915.
- McAdams, D.P., & de St. Aubin, E. (1998). *Generativity and adult development: How and why we care for the next generation*. Washington, DC: American Psychological Association.
- McCord, J. (1992). Understanding motivations: Considering altruism and aggression. In J. McCord (Ed.), *Facts, frameworks, and forecasts: Advances in criminological theory, volume 3* (pp. 115–135). New Brunswick, NJ: Transaction.
- McGue, M., Bacon, S., & Lykken, D.T. (1993). Personality stability and change in early adulthood: A behavioral genetic analysis. *Developmental Psychology, 29*, 96–109.
- Moffitt, T.E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review, 100*, 674–701.
- Neale, M.C. (1997). *Mx: Statistical modeling* (4th ed.). (Available from Department of Psychiatry, Box 126 MCV, Richmond, VA 23298)
- Penner, L.A., Fritzsche, B.A., Craiger, J.P., & Freifeld, T.S. (1995). Measuring the prosocial personality. In J.N. Butcher & C.D. Spielberger (Eds.), *Advances in personality assessment* (Vol. 10, pp. 147–163). Hillsdale, NJ: Erlbaum.
- Piliavin, J.A., & Charng, H.-W. (1990). Altruism: A review of recent theory and research. *Annual Review of Sociology, 16*, 27–65.
- Plomin, R., & Caspi, A. (1999). Behavioral genetics and personality. In L.A. Pervin & O.P. John (Eds.), *Handbook of personality: Theory and research* (pp. 251–276). New York: Guilford.
- Riemann, R., Angleitner, A., & Strelau, J. (1997). Genetic and environmental influences on personality: A study of twins reared together using the self- and peer report NEO-FFI scales. *Journal of Personality, 65*, 449–475.
- Rowe, D.C. (1994). *The limits of family influence: Genes, experience, and behavior*. New York: Guilford.
- Rushton, J.P., Chrisjohn, R.D., & Fekken, G.C. (1981). The altruistic personality and the Self-Report Altruism Scale. *Personality and Individual Differences, 2*, 293–302.
- Rushton, J.P., Fulker, D.W., Neale, M.C., Nias, D.K.B., & Eysenck, H.J. (1986). Altruism and aggression: The heritability of individual differences. *Journal of Personality and Social Psychology, 50*, 1192–1198.
- Rushton, J.P., Fulker, D.W., Neale, M.C., Nias, D.K.B., & Eysenck, H.J. (1989). Aging and the relation of aggression, altruism and assertiveness scales to the Eysenck Personality Questionnaire. *Personality and Individual Differences, 10*, 261–263.
- Rutter, M.L. (1997). Nature-nurture integration: The example of antisocial behavior. *American Psychologist, 52*, 390–398.
- Schroeder, D.A., Penner, L.A., Dovidio, J.F., & Piliavin, J.A. (1995). *The psychology of helping and altruism*. New York: McGraw-Hill.
- Seligman, M.E.P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist, 55*, 5–14.
- Stitt, B.G., & Giacomposi, D.J. (1992). Trends in the connectivity of theory and research in criminology. *The Criminologist, 17*, 1–6.
- Tellegen, A. (1985). Structures of mood and personality and their relevance to assessing anxiety, with an emphasis on self-report. In A.H. Tuma & J.D. Maser (Eds.), *Anxiety and the anxiety disorders* (pp. 681–706). Hillsdale, NJ: Erlbaum.
- Tellegen, A. (2000). *Manual for the Multidimensional Personality Questionnaire*. Minneapolis: University of Minnesota Press.
- van den Bree, M.B.M., Sviki, D.S., & Pickens, R.W. (1998). Genetic influences in antisocial personality and drug use disorders. *Drug and Alcohol Dependence, 49*, 177–187.
- Waller, N.G., & Shaver, P.R. (1994). The importance of nongenetic influences on romantic love styles: A twin-family study. *Psychological Science, 5*, 268–274.
- Wispe, L.G. (1972). Positive forms of social behavior: An overview. *Journal of Social Issues, 28*, 1–19.

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