Integrating Classical and Contemporary Explanations of Political Participation

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Traditional theories of political participation have emphasized its social and normative components; however, recent evidence suggests that political participation has a strong additive genetic component. Accordingly, it is necessary to reevaluate the traditional empirical findings and begin to integrate the two approaches. To do so, a variety of analyses were conducted that explore the modes of genetic and environmental transmission. I find that the empirical estimates of the relationships between the phenotypic level traits are highly consistent with what has been found in the traditional literature, the vast majority of the variance in political participation that is accounted for by the predictor variables is being accounted for at the genetic level, and not at the environmental level. Thus, the current findings suggest that the empirical results found in prior studies are quite likely very accurate. However, the interpretation of those empirical findings, as well as the subsequent theoretical implications, require serious revision.

∎ **Keywords:** political participation, personality traits, direction of causation

Existing theories of political participation, and especially voting behavior, focus on the social components of politics at the expense of innate, biological, or genetic components. It has traditionally been argued that people participate in politics if the probability that their participation will influence the outcome outweighs the costs of participating (Downs, 1957). Accordingly, people evaluate their political environment and, in a rational manner, engage in relevant political behaviors that will have the greatest likelihood of affecting the political outcome. The problem with this conceptualization is that the costs incurred by political participation almost invariably outweigh the probability that any single individual's contribution will have any tangible influence on the outcome (Gelman, Katz, & Bafumi, 2004). Accordingly, the act of participation is irrational (Riker & Ordeshook, 1968). Thus, it becomes imperative to identify psychological mechanisms that capture the 'benefits' an individual derives from participation that do not depend on the individual's behavior affecting the political outcome.

This line of research has illuminated several factors that encourage political participation along, with a variety of limiting conditions. In this paper I focus on a few individual difference factors that affect political participation. I ignore the institutional factors such as compulsory voting,

links between political parties and social groups, multipartyism, minimum voting age, costs associated with voting, and unicameralism (Blais, 2006; Franklin, 1996; Gimpel & Schucknecht, 2003; Jackman, 1987); and temporal aspects such as the competitiveness of elections (Powell, 1986), because these factors have been dealt with elsewhere (Blais, 2000; Blais, 2006).

Recent attempts to understand the dispositional features of political participation argue that political participation has a genetic component, suggesting that, although the manifestation of political engagement is social, the motivation to actually engage in political participation may be, in part, biological (Fowler, Baker, & Dawes, 2008; Hatemi, Medland, Morley, Heath, & Martin, 2007). Although the social and genetic explanations may appear incongruent, this incongruence is easily exaggerated. Because political participation research has a very

long history with several very well replicated and robust explanations, it is important not to throw the proverbial baby out with the bathwater and begin anew searching for explanations for why people engage in politics. Accordingly, the focus of the current paper is not to uncover a unique predictor of participation, but rather, to begin the process of integrating these two disparate lines of research and demonstrate that the traditional psychological mechanisms that underscore the motivations to engage in political participation are, in fact, consonant with the more recent genetic findings.

Examining the Traditional Explanation of the Impact of Individual Differences on Political Participation

Traditional explanations of political participation and turnout from a rational choice perspective have grappled with the fact that even the relatively minor costs of participation undoubtedly outweigh the probability that an individual's contribution will have any tangible influence on political outcomes (Downs, 1957; Riker & Ordeshook, 1968). Thus, it was necessary to incorporate a psychological benefit derived from engaging in political participation that is independent from the probability an individual, because of his own political participation, will alter the political outcome. Accordingly, scholars have sought to identify the relevant dimensions that motivate political participation. In this section I focus on six predictors of participation: political efficacy, political knowledge, education, openness to experience, extraversion, and conscientiousness. Two caveats are necessary from the outset. First, while replicable results are beginning to emerge in the realm of personality and political participation, these results should be viewed as preliminary. Second, although these predictors reliably relate to participation, this is not an exhaustive set of predictors, nor is it intended to be.

Specifically, higher levels of political efficacy, or the belief that one's actions are important and can make a difference, greatly enhance the probability that an individual will participate in political affairs (Finkel, 1985; Finkel, 1987). Essentially, people who are high in political efficacy participate because they believe that their effort will have tangible political consequences, independent of whether or not their actions actually influence the outcome in a rational sense. Similarly, people who have larger stores of political knowledge are more likely to participate in politics. Further, people with higher levels of education tend to participate in larger numbers, in part because of the fact that they are generally more interested in politics; however, there is also an independent effect of education on the likelihood of participation (Blais, 2000).

More recently, political scientists have begun to explore whether stable individual differences, or personality traits, affect the likelihood an individual will participate (Mondak, 2010; Mondak, Hibbing, Canache, Seligson, & Anderson, 2010). Most notably, political scientists have explored personality traits from the five factor model (FFM) of personality: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Preliminary results suggest that three of these FFM personality traits have a significant impact on whether people participate in politics. There are no reasons, theoretical or empirical, to expect that neuroticism and agreeableness should have any impact on turnout.

Essentially, because political participation is inherently a social activity, extraverts are more likely to participate because they are generally more likely to engage in any social behavior. Accordingly, extraverts are more likely to attend rallies, meetings, or fundraising dinners, behaviors that clearly have a social component (Mondak, 2010). Furthermore, people who are open to new experiences are also more likely to participate in politics, but in contrast with extraversion, people who are open to experience are motivated by informational goals. Thus, research has demonstrated that people who are open to information are more likely to discuss politics with others and attend rallies, even after controlling for extraversion. Finally, conscientiousness has also been reliably related to political participation; however, this effect is rather paradoxical. Conscientiousness seems as though it should encapsulate a sense of civic duty or model citizenship, because conscientiousness relates to interpersonal reliability, self-discipline, deliberativeness, and acting in accordance with one's conscience. The empirical effect of conscientiousness on political participation, however, is generally negative. Therefore, although one may expect people who are highly conscientiousness to be more likely to participate in politics, the reverse is actually true.

Importantly, the underlying motivational component that drives people to be extraverted, conscientious, or open to experience is typically cast in dispositional terms. Thus, implicitly, there is something innate or immutable about these traits, and while they may vary across situations, they are fairly stable over time. Alternatively, it is completely reasonable to believe that these factors may predict political participation for social reasons. For example, extraverts may be more likely to know political activists, who subsequently recruit them to engage in politics (Brady, Verba, & Schlozman, 1994). People who are open to experience may be more likely to encounter information, making them more susceptible to get-out-and-vote campaigns.

Integrating Traditional and Genetic Explanations of Political Participation

Although traditional accounts of political participation implicitly focus on the environmental and social precursors of participation at the potential expense of biological or genetic explanations, this is not the only way to interpret the existing empirical findings. While the theoretical understanding of political participation must be revised in light of the fact that we have evidence suggesting that

political participation has a strong genetic component, these recent genetically informed findings do not necessarily invalidate the existing results.

Importantly, research has already begun to explore the univariate variance decompositions of several traits relevant to political participation. Most centrally, Fowler et al. (2008), using a variant of the univariate twin design, demonstrated that political participation has a significant genetic component. They found that approximately half of the variance in voting behavior was accounted for by additive genetic variance, while the other half was accounted for by the unshared twin environment. Interestingly, in their analysis, virtually no variance was captured by the shared environment.

Similarly, research in personality psychology has repeatedly found that personality traits generally have significant additive genetic components and a negligible common environmental component (Plomin & Caspi, 1999). Specifically, additive genetic variance captures approximately half of the variance in all five of the FFM personality traits, a pattern that is consistent across the vast majority of individual difference measures (Bouchard & McGue, 2003). Thus, although political scientists have yet to explore whether political knowledge and political efficacy have significant genetic variance components, it is reasonable to expect that the mode of transmission for these measures would be similar to other measures of individual difference. As shown in Table 1, both political knowledge and political efficacy have significant genetic components.

The question then becomes: How do we integrate the traditional pattern of results into the behavioral genetic framework? From one perspective, it would be expected that the relationships between the various predictors identified above and political participation would be localized in the environmental variance components. Essentially, this would substantiate the implicit assumption within the political participation literature that political behavior is, at root, environmental. However, it is more likely that, because the variables under investigation all have significant genetic components, the relationships identified in the traditional political participation literature are, at least to some extent, a function of additive genetic relationships.

In an attempt to answer this question, I conduct three separate analyses. First, I decompose the variance of each trait into additive genetic and shared and unshared environmental variance components to examine the mode of transmission of the relevant variables. Next, I examine the phenotypic relationships that exist between the predictors and political participation, using a simple Ordinary Least Squares (OLS) regression model. Finally, using a modified version of a direction of causation (DoC) model, I examine the impact of the predictors on political participation.

Method

Respondents

The data for this project comes from the Minnesota Twins Political Survey. The sample was recruited from the Minnesota Twin Registry in 2009–2010, which recruits respondents from the larger Minnesota area. The sample contains 1349 individuals from 741 pairs of twins: 476 monozygotic (MZ) female twins (213 complete pairs), 315 MZ male twins (143 complete pairs), 369 dizygotic (DZ) female twins (154 complete pairs), and 189 DZ male twins (86 complete pairs). All respondents were born between 1947 and 1956. Of the sample, 99% identified as white. Accordingly, 20 nonwhite respondents were excluded from further analysis. No opposite sex twins were recruited for this study. The sample was recruited primarily through an online survey, but paper surveys were sent to 240 respondents upon request. The cooperation rate was 61% (for more information see Smith et al., 2012). Because there are extremely small numbers of several key demographic groups, and a truncated age range, sampling weights were not employed to attempt to make the sample more nationally representative.

Political Participation

Consistent with the general conceptualization of political participation, a participation index was calculated as the sum of five dichotomous items: whether the respondent attended a political rally, worked on a campaign, contributed to a political party, or was contacted by either of the political parties, and whether or not they intended to vote (alpha = .70). For ease of interpretation, the scale was then recoded to range between zero and one. As can be seen, there is a mixture of both social and private components to the participation measure.

Political Efficacy

Political efficacy was measured with a 10-item additive Likert scale. The underlying construct behind all of the items is whether the individual believes that their actions will influence political outcomes (Cronbach's α = .74). Complete wording of the items can be found in Appendix A.

Political Knowledge

Political knowledge was assessed by summing the number of correct responses to five multiple-choice items on general political knowledge (Cronbach's α = .73). Item wordings for the knowledge scale can be found in Appendix A.

Personality Traits

The personality traits were assessed using 10-item scales written by John and Srivastava (1999). All of the personality traits were measured reliably, (openness, Cronbach's α = .82; conscientiousness, Cronbach's α = .76; extraversion, Cronbach's α= .86; agreeableness, Cronbach's α = .74;

neuroticism, Cronbach's α= .83). Item wordings can be found in Appendix A.

Party Identification

To assess party identification, the survey asked 'Generally speaking, which of the following best describes your partisan affiliation?' Participants responded on a five-point scale ranging from *strong Democrat* (low) to *strong Republican* (high).

Education

The education item was a six-point categorical scale ranging from *did not finish high school* (low) to *professional or graduate training* (high).

Results

The analyses progress in three stages. In the first stage, I present the means and conduct a univariate variance decomposition model to examine the proportion of variance in each variable that can be attributed to genetic or environmental sources of variance. Then, I explore the phenotypic relationships between political participation and the relevant predictors using a simple OLS regression, analogous to the models constructed in the traditional political participation literature. Finally, I conduct a modified direction of causation analysis (DoC; Neale & Cardon, 1992; Heath et al., 1993) that capitalizes on the genetically informative nature of the sample and incorporates the key elements from the traditional political participation literature into the analysis.

Univariate Variance Decomposition

Table 1 presents the means for the MZ and DZ twins for each of the relevant variables, as well as the individual variance components of political participation and the predictors used in the subsequent models. To do this, I use a univariate ACE structural equation model to decompose the variance of the political participation and the significant predictors identified above into three separate sources of variance: additive genetic, common environ-

mental, and unique environmental (for a detailed explanation of the methodology and theory, along with limitations and criticisms, see Medland and Hatemi 2008). The additive genetic factor (A) is the sum of the linear additive influence of all individual genes on the dimensions. The common or shared environmental factor (C) accounts for systematic attempts at socialization, within-family similarity in environment, and common social background (e.g., family income, neighborhood). The unique environmental factor (E) represents unique, random, idiosyncratic, or unshared environmental variance. The means of each variable separated by zygosity, as well as the unstandardized path coefficients and the standardized variance components are presented in Table 1.

As can be seen in Table 1, all of the variables have a substantial portion of the variance that is accounted for by the additive genetic variance component as well as the unshared environmental variance component. Furthermore, for every variable, the common environmental component is indistinguishable from zero and is therefore dropped from subsequent analyses. The standardized variance components presented in the last three columns of Table 1 show that roughly one-third to one-half of the variance is accounted for by the additive genetic variance for every variable. Furthermore, there are significant mean differences between the participation rates of MZ and DZ twins that require separate means for each twin group in the subsequent analysis. The means for all other variables were statistically equivalent across the twin groups.

The unstandardized pathways are presented in columns 3, 4, and 5. Although the standardized estimates of the genetic and environmental variance components are easier to explicate in the univariate case, standardizing the effects does forfeit some very useful information about the traits. As is clearly evident, there are differences in the magnitude of variance in the various traits due to the scaling of the variables. Specifically, participation, political knowledge, and education simply have more variance at both the

TABLE 1

Means and Univariate Variance Decomposition

	Mean		Unstandardized path estimates			Standardized variance components		
	MZ	DZ	a	c	e	A	C	E
Participation	0.350 [.33, .37]	0.311 [.28, .34]	0.180 [.09, .21]	0.072 [.00, .16]	0.219 [.20, .24]	0.378 [.10, .52]	0.061 [.00, .30]	0.561 [.48, .65]
Efficacy	0.394 [.38, .41]	0.387 [.37, .40]	0.105 [.08, .12]	0.000 [–.06, .06]	0.126 [.12, .13]	0.411 [.23, .49]	0.000 [.00, .15]	0.589 [.51, .67]
Openness	0.605 [.59, .62]	0.618 [.60, .63]	0.122 [.11, .13]	0.000 [–.05, .05]	0.121 [.11, .13]	0.502 [.39, .57]	0.000 [.00, .09]	0.498 [.43, .58]
Conscientiousness	0.793 [.78, .80]	0.803 [.79, .82]	0.082 [.05, .09]	0.000 [–.06, .06]	0.116 [.11, .12]	0.336 [.13, .42]	0.000 [.00, .17]	0.665 [.58, .75]
Extraversion	0.538 [.52, .56]	0.551 [.53, .57]	0.153 [.13, .17]	0.000 [–.07, .07]	0.149 [.14, .16]	0.512 [.37, .58]	0.000 [.00, .12]	0.488 [.42, .56]
Knowledge	0.704 [.68, .73]	0.695 [.67, .72]	0.232 [.19, .25]	0.000 [–.12, .12]	0.210 [.20, .23]	0.549 [.37, .61]	0.000 [.00, .15]	0.452 [.39, .53]
Education	4.021 [3.90, 4.14]	3.962 [3.83, 4.09]	1.140 [0.95, 1.22]	0.112 [–.79, .68]	0.731 [.68, .79]	0.704 [.49, .75]	0.007 [.00, .21]	0.289 [.25, .34]

Note: All of the models were estimated using a full information maximum likelihood estimator (FIML) with 1329 individuals nested within 740 families. The means [and 95% confidence intervals] for the monozygotic (MZ) and dizygotic (DZ) twin groups were freely estimated for all the models. A = Additive Genetic Variance Component; C = Shared Environmental Variance Component; E = Unique Environmental Variance Component.

additive genetic and unshared environmental levels than political efficacy and the relevant FFM personality traits.

Phenotypic Regression Analysis

As can be seen in Table 2, in line with expectations, higher levels of political efficacy, political knowledge, and education increase the probability that citizens will participate in politics. Also in line with expectations, openness to experience and extraversion increase the likelihood that individuals will engage in political activities, while those who are more conscientious are less likely to participate in politics. Finally, in line with the previous research, neuroticism and agreeableness have virtually no impact on the likelihood of political participation.

A reduced model was estimated that removed the non-significant variables from the model to simplify the subsequent genetic analyses. As can be seen in the second column of Table 2, the statistical estimates change minimally when the nonsignificant parameters are excluded from the model, and the substantive meanings are unaffected by the model specification. As such, to simplify subsequent analyses I only include the significant predictors.

Direction of Causation

The parameter estimates from the modified version of the DoC model can be interpreted in the same way as an OLS regression, with the added benefit of being a genetically informative statistical model. The regression pathways are presented in the final column of Table 2. The complete path specification of the model for one twin is presented in Figure 1.

To facilitate a direct comparison to the traditional empirical exploration of political participation, Table 2 presents the unstandardized regression pathways from the modified DoC model estimated using full information maximum likelihood. As can clearly be seen, the two models are nearly identical: the regression parameters are essentially equal across the models, suggesting the empirical findings derived from the traditional understanding of political participation are essentially unchanged.

The major difference between the modified DoC model presented here and prior empirical research on political participation lies in our ability to estimate the proportion of variance that is accounted for by the regression model at the genetic and environmental levels. Thus, in the phenotypic regression model, the multiple R^2 indicates that the predictors account for approximately 28% of the variance in political participation. This statistic, while accurate, is a little misleading. The modified DoC model indicates that the predictors are accounting for more than two-thirds (71%) of the variance at the additive genetic level and one-fifth (19%) of the variance at the environmental level. Accordingly, the relationship between the predictors and political participation is primarily found at the additive genetic level. Thus, rather than political participation being driven by environmental relationships,

TABLE 2

Factors Influencing the Likelihood of Political Participation at the Phenotypic Level

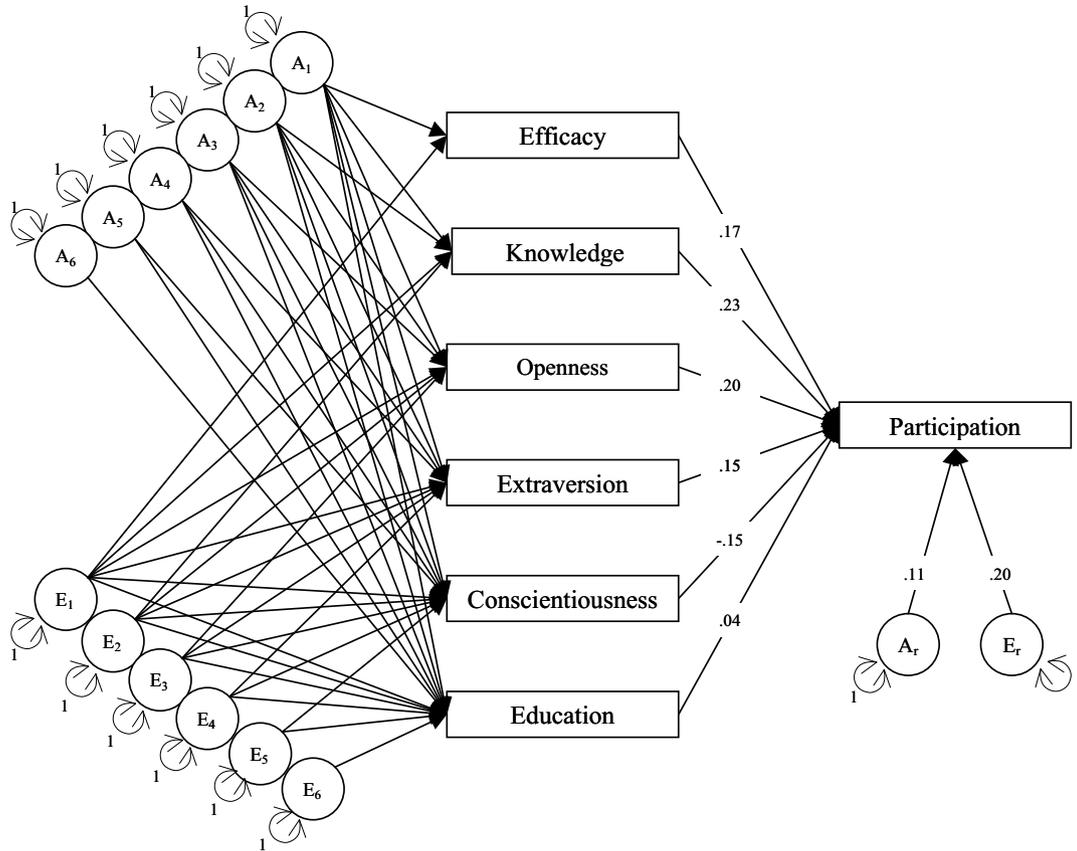|	Full model	Reduced model	Modified DoC model
Efficacy	0.186 (0.048)	0.194 (0.045)	0.172 (0.040)
Openness	0.232 (0.048)	0.229 (0.046)	0.201 (0.040)
Conscientiousness	−0.175 (0.057)	−0.165 (0.050)	−0.147 (0.045)
Extraversion	0.160 (0.041)	0.176 (0.037)	0.150 (0.032)
Agreeableness	0.022 (0.065)		
Neuroticism	−0.001 (0.043)		
Party ID	−0.029 (0.030)		
Knowledge	0.257 (0.028)	0.262 (0.025)	0.229 (0.023)
Education	0.047 (0.007)	0.046 (0.006)	0.041 (0.005)
Male	0.026 (0.017)		
Intercept	−0.232 (0.086)	−0.215 (0.047)	
N(clusters)	1180 (713)	1307 (737)	1329 (740)
R^2	0.272	0.283	A = 0.71, E = 0.19

Note: The full model and the reduced model were estimated in Stata using list-wise deletion to account for missingness. The modified DoC (direction of causation) model was estimated in OpenMx (Boker et al., 2011) using a full information maximum likelihood estimator. In the modified DoC model, means for participation were estimated separately by twin group. The R^2 for the genetic and environmental variance components in column 3 was calculated by the ratio of genetic and environmental variance explained to the total genetic and environmental variance (presented in Table 1).

the relationships identified by the traditional participation literature appear to be operating at the genetic level. Therefore, clearly the predictors identified by the traditional political participation literature are operating through common genetic processes to a greater extent than through environmental processes.

Discussion

The results presented in this paper replicate several well-established empirical relationships derived from the traditional literature on political participation and reevaluate them in light of the recent finding that political participation has a strong genetic component (Fowler et al., 2008). The empirical results are extremely consistent, regardless of whether the researcher implicitly assumes that the psychological process is occurring at the environmental level, remains agnostic as to the level at which the independent variables are acting, or explicitly accounts for the influence of the independent variables at the genetic and environmental levels. The innovation derived from explicitly accounting for the effect of the independent variables and both the genetic and environmental levels rests on our ability to understand more about the underlying psychological mechanisms that prompt people to participate, or abstain from engaging, in political affairs.

Although, in general, the empirical results are not altered by accounting for the genetic and environmental relationships, the current findings have major implications for the

	A₁	A₂	A₃	A₄	A₅	A₆		E₁	E₂	E₃	E₄	E₅	E₆
Efficacy	**0.10**							**0.13**					
Knowledge	**0.11**	**0.20**						*0.00*	**0.21**				
Openness	**0.02**	**0.03**	**0.12**					*0.00*	*0.01*	**0.12**			
Extraversion	*0.00*	*-0.02*	*0.06*	**0.14**				*0.00*	*0.01*	*0.05*	**0.14**		
Conscientiousness	*0.01*	*-0.01*	*-0.01*	*0.03*	**0.07**			*0.00*	*0.00*	*0.03*	*0.01*	**0.11**	
Education	**0.51**	**0.58**	*0.09*	*-0.04*	*-0.01*	**0.84**		*0.04*	*0.08*	**0.13**	*0.05*	*0.04*	**0.72**

FIGURE 1

Path specification for the modified direction of causation (DoC) model. The parameter estimates in the figure are unstandardized path coefficients. Latent variables are depicted in circles and manifest variables in boxes. To minimize redundancy and simplify the presentation of the model, the path diagram is drawn for one twin; however, all pathways are constrained to equality across twins. The Additive Genetic (A) and Unique Environmental (E) Cholesky matrices are presented below the figure and should be interpreted as flowing from the latent variable to the manifest variable. All of the pathways in the figure are significant ($p < .05$). The bolded estimates in the Cholesky matrix are significant, while the italicized estimates are not.

theoretical understanding of political participation. Specifically, because the variables identified above primarily explain additive genetic variance in political participation, it becomes implausible to insist that environmental factors induce the principal motivation to engage in politics.

Instead, some persistent internal disposition motivates people to engage in politics.

Naturally, this study does not include an exhaustive list of potential predictors of political participation. Although the predictors used clearly account for a large portion of

the variance in participation, the set of predictors generally has a dispositional flavor. All of the predictors have significant genetic components. A different set of predictors with different modes of genetic and environmental transmission would possibly account for a greater amount of the environmental variance. However, this may not necessarily be the case. Notably, with a very limited set of predictors at the phenotypic level, it is possible to account for more than one-quarter of the variance in political participation, which is highly comparable to the amount of variance that is accounted for with much more saturated models. For example, Plutzer (2002) includes 32 predictors and accounts for 31% of the variance. Therefore, although the current model accounts for slightly less variance in political participation than the so-called kitchen sink approach, the decreased fit is far from overwhelming. Importantly, at the genetic level, I am accounting for more than two-thirds of the variance in political participation: considerably more variance than is typically explained by traditional models of political participation.

Limitations

The interpretation of these results should take into consideration four limitations. Most prominently, this paper is narrowly focused on the psychological individual difference mechanisms that drive political participation, and ignores the institutional and contextual factors that have been demonstrated elsewhere to influence participation (Blais, 2000).

Second, throughout the paper, and in the literature more broadly, the FFM traits are portrayed as immutable aspects of the individual. Personality traits, however, change over time and are expressed in different ways in different situations. For example, extraverts in one situation may be introverts in another. This situationalist view of personality (Mischel, 1968) has potentially major implications for the interpretation of the current results. If personalities are inconsistent across situations, measured personality traits such as those used in the current paper may have limited applicability. Importantly, because reliable relationships between participation and the FFM traits are found, this limitation is not overly concerning.

More tenuous is the explicit modeling of causal pathways. The causal pathways presented in this paper are derived from the expectations from the extant literature. It is entirely plausible, however, that causality flows in the opposite direction (e.g., Verhulst, Eaves & Hatemi, 2012). Moreover, it is possible that the relationships between the current factors and political participation should be characterized in correlational rather than causal terms, with a shared set of latent genes contributing to the relevant factors (pleiotropy) (Verhulst, Hatemi, & Martin, 2010). Accordingly, it would not be true that higher levels of the predictors increase the probability of participation, but rather, a latent set of shared genes drives everything. Although this explanation is plausible, because the modes

of transmission for all the variables in the model are essentially equivalent, it is virtually impossible to effectively test the direction of causation (Heath et al., 1993).

Finally, in the current study there is no evidence for a common environmental influence on political participation. Although this may be counterintuitive, it replicates earlier heritability studies in political participation (Fowler et al., 2008). Replication notwithstanding, there are two alternative explanations for why shared environmental effects were not identified. First, the composition of the sample is not ideal for finding shared environmental effects. Specifically, as the proportion of MZ to DZ twins increases, the probability of finding additive genetic effects increases and the probability of finding shared environmental effects decreases (Martin, Eaves, Kearsey, & Davies, 1978; Visscher, 2004). Because the current sample is approximately 67% MZ twins, the power to accurately detect the shared environmental effects is relatively low, given the current sample size. To combat this, it is often necessary to have very large sample sizes (Visscher, Gordon, & Neale, 2008). Alternatively, it is possible that political participation is more comparable to personality traits (which typically have an AE structure similar to the dimensions presented here) and less comparable to attitudes, which, depending on the attitude or factor, may have a significant C component.

Future Research

Although this project was intended to be an initial analysis of the underlying motivation to engage in politics, these findings highlight two interrelated possibilities for future research. First, it is possible that the impact of genetic variation is moderated by institutional or contextual factors: a gene–environment interaction. For example, the same genes that motivate an individual to engage in politics or to vote in the United States (where participation and voting levels are comparatively low) may not influence participation or voting where voting is compulsory, such as Australia, or where there are exceptionally strong norms for voting, such as Denmark (Klemmensen, Hobolt, & Nørgaard, 2010). To address this question, it is necessary to collect data with comparable measures in different contexts or in countries with different institutional requirements for participation.

Second, it is possible that an individual's genes are correlated with the person's environment. For example, people may be motivated, for latent genetic reasons, to choose environments that allow them to participate in, or abstain from, political affairs. People may relocate to districts that provide more or less opportunities to engage in politics, such as college students moving to Washington DC to intern with a political campaign. This nonrandom selection of environments creates an active gene–environment correlation (active rGE). Importantly, individuals do not actively select all of their environments, a fact that is particularly true for younger people. As such, individuals inherit both environmental and genetic factors from their

parents, which induces a passive gene–environment correlation (passive rGE). To explore the possibility of gene–environment correlations, it is necessary to have either longitudinal data (for active rGE) or generational data (for passive rGE).

Conclusion

The goal of the current study was to begin to integrate the traditional results from the political participation literature with the more recent evidence that genes play a nontrivial role in political participation. Importantly, the pattern of phenotypic relationships identified in the current study strongly corresponds with the relationships identified in the traditional political participation literature. This study departs from the traditional interpretation of the empirical findings by demonstrating that the relationships between the variables identified in prior research are localized at the genetic level.

Acknowledgments

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Appendix A
Item Wording for the Additive Scales

Political Efficacy Scale

1. Elected officials would help the country more if they would stop talking and just take action on important problems.
2. Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people? *
3. How much of the time do you think you can trust the government in Washington to do what is right? *
4. Would you say the government is pretty much run by a few big interests looking out for themselves or that it is run for the benefit of all the people?
5. Do you think that people in government waste a lot of the money we pay in taxes, waste some of it, or don't waste very much of it?
6. Do you think that quite a few of the people running the government are crooked, not very many are, or do you think hardly any of them are crooked?
7. What some people call compromise in politics is really just selling out on one's principles.
8. When people argue about politics, I feel uneasy and uncomfortable.
9. Public officials don't care much about what people like me think.
10. People like me don't have any say in what the government does.

Response Options

1. Strongly Agree
2. Agree
3. Neither Agree nor Disagree
4. Disagree
5. Strongly Disagree

* the item is reverse coded

Political Knowledge

1. Who has the final responsibility to decide if a law is constitutional or not?

(a) The President

(b) Congress

(c) The Supreme Court

(d) Not Sure

2. Whose responsibility is it to nominate judges to the Federal Courts?

(a) The President

(b) Congress

(c) The Supreme Court

(d) Not sure

3. Which of the political parties is more conservative than the other at the national level, Democrats or Republicans?

(a) Democrats

(b) Republicans

(c) Not sure

4. How much of a majority is required for the U.S. Senate and House to override a presidential veto?

(a) A bare majority of 50% plus one

(b) Two-thirds majority (67% more more)

(c) Three-fourths majority (75% or more)

(d) Not sure

5. What is the main duty of the U.S. Congress?

(a) To write laws

(b) To administer the President's policies

(c) To supervise States' governments

(d) Not sure

.**Five Factor Model Personality Traits**

All of the personality items had a common stem and responses options. The stem asked '*I see myself as someone who …*' and the response options were:

1. Disagree strongly
2. Disagree a little
3. Neither agree nor disagree
4. Agree a little
5. Agree strongly

Openness to Experience

1. is original, comes up with new ideas.
2. is curious about many different things.
3. is ingenious, a deep thinker.
4. has an active imagination.
5. is inventive.
6. values artistic, aesthetic experiences.
7. prefers work that is routine.*
8. likes to reflect and play with ideas.
9. has few artistic interests.*
10. is sophisticated in art, music, or literature.

Conscientiousness

1. does a thorough job.
2. can be somewhat careless.*
3. is a reliable worker.
4. tends to be disorganized.*
5. tends to be lazy.*
6. perseveres until the task is finished
7. does things efficiently.
8. makes plans and follows through with them.
9. is easily distracted.*

Extraversion

1. is talkative
2. is reserved.*
3. is full of energy.
4. generates a lot of enthusiasm.
5. tends to be quiet.*
6. has an assertive personality.
7. is sometimes shy, inhibited.*
8. is outgoing and sociable.

Agreeableness

1. tends to find fault with others.*
2. is helpful and unselfish with others.
3. starts quarrels with others.*
4. has a forgiving nature.
5. is generally trusting.
6. can be cold and aloof*
7. is considerate and kind to almost everyone.
8. is sometimes rude to others.*
9. likes to cooperate with others.

Neuroticism

1. is depressed, blue.
2. is relaxed, handles stress well.*
3. can be tense.
4. worries a lot.
5. is emotionally stable, not easily upset.*
6. can be moody.
7. remains calm in tense situations.*
8. gets nervous easily

* item is reverse coded