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Neuroticism and Extraversion Share Genetic and Environmental Effects with Negative and Positive Mood Spillover in a Nationally Representative Sample

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Abstract

Work-family spillover research focuses on how negative and positive moods in one life domain carry over to another domain. Domain-specific etiologies (e.g., family conflict) are often emphasized to explain spillover. Yet, strong correlations exist between spillover variables of the same emotional valence and originating from different domains, suggesting individual differences in the tendencies to prolong mood-states. The current study (*N*=1143 individuals) examined whether these general tendencies are associated with neuroticism and extraversion, and how genetic and environmental effects contribute to these associations. Findings revealed that neuroticism and extraversion are related to these tendencies through genetic and environmental pathways.

Keywords

neuroticism; extraversion; mood spillover; genetic effects; environmental effects

Research suggests that the metaphor describing how one "kicks the dog" after a stressful day at work holds some truth. Both negative and positive moods arising at work can carry over to the home environment (Greenhaus & Beutell, 1985). For example, work strain can translate into irritability at home. Negative and positive moods can also spill over from home to work (Crouter, 1984). For example, a relaxing evening at home can foster positive moods that translate into a more satisfying day at work. These phenomena refer to work-family spillover and include: negative work-to-family (NWF), negative family-to-work (NFW), positive work-to-family (PWF), and positive family-to-work spillover (PFW).

Researchers have emphasized predictors unique to the work or home environment to describe spillover phenomena (Greenhaus & Beutell, 1985). For example, an inflexible work environment predicts NWF, whereas marital satisfaction predicts PFW (Crouter, 1984; Greenhaus & Beutell, 1985). If domain-specific antecedents were entirely responsible for spillover, the strongest correlations would arise between constructs sharing an environmental origin (e.g., NFW and PFW). Yet, studies have shown that the strongest associations exist between spillover variables of similar emotional valence (e.g., NWF and NFW; e.g., Grzywacz & Marks, 2000), suggesting general tendencies to prolong these mood-states.

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[1]The PWF α=.72 when item c was included with the other three items, and α=.65 when item b was included with the other three items. Univariate and multivariate models yielded similar parameter estimates and fit statistics, regardless of whether these items were included/omitted from PWF and PFW. Although .66 for PFW is below the acceptable standard, α=.70 when using a larger non-twin MIDUS sample (Grzywacz & Marks, 2000).

The current study assessed the extent to which neuroticism and extraversion, both related to emotional experiences, are associated with tendencies to prolong negative (measured as the correlation between NWF and NFW) or positive (correlation between PWF and PFW) mood-states across work and family domains. Furthermore, we examined how genetic and environmental effects account for these associations.

Two models describe reasons for these prolonged mood-states (Edwards & Rothbard, 2000). The indirect-spillover model contends that individuals' emotional and cognitive reactions are mechanisms through which experiences from one domain impact experiences in another domain (Lambert, 1990). For example, marital conflict may evoke anxiety that could cause the individual to ruminate about this problem at work. To the extent that people have predictable responses across different environmental domains, this model suggests that trait-like qualities create similar reactivity and carryover tendencies regardless of the environmental source. The congruence model posits that similar mood states at work and home arise from common causes with heritable individual differences such as personality traits (Edwards & Rothbard, 2000). These common causes are often attributed to neuroticism and extraversion because they are related to stable negative or positive moods across life domains (Frone, Russell, & Cooper, 1994).

Neuroticism and extraversion may be associated with prolonged emotional states at work and home because they involve predictable emotional experiences (Costa & McCrae, 1992). Neuroticism is related to negative reactivity to daily events, general emotional distress (Mroczek & Almeida, 2004; Suls & Martin, 2005), negative work-family spillover (Grzywacz & Marks, 2000), and conflict or interference between work and family domains (Boyar & Mosley, 2007; Rantanen, Pulkkinen, & Kinnunen, 2005; Wayne, Musisca, & Fleeson, 2004). In contrast, extraversion is associated with positive reactivity to daily experiences, positive emotions (Larsen & Ketelaar, 1991), positive work-family spillover (Grzywacz & Marks, 2000) and facilitation between work and family domains (Wayne et al., 2004). Furthermore, genetic and unique environmental (individual-specific experiences) variance components influence neuroticism and extraversion (e.g., Bouchard & McGue, 2003). It is possible that neuroticism and extraversion share these influences with prolonged mood-states.

The current study investigated reasons for the association between NWF and NFW and between PWF and PFW by examining whether neuroticism and extraversion are related to these tendencies. We hypothesized that higher neuroticism and lower extraversion are related to greater NWF and NFW and to lower PWF and PFW. Behavioral genetic analyses then modeled the degree to which genetic and environmental variance components explain the associations between spillover constructs of the same mood valence and these personality traits.

Method

Participants

The sample was derived from the Midlife in the United States (MIDUS) study, consisting of 998 nationally-representative adult twin pairs (for detailed description, see Kessler, Gilman, Thornton, & Kendler, 2004). Members of twin pairs were randomly designated as either Twin1 or Twin2. In the current analyses, twin pairs were excluded if they belonged to opposite-sex pairs (n=263), had unknown/missing zygosity (n=16), or if both twins failed to complete the questionnaire (n=24). Seventeen additional pairs from families contributing two or more pairs were excluded to ensure that only one pair represented each family.

To examine spillover involving work-related activities, we included members from twin pairs who endorsed any of the following: full/part-time work, volunteer-time (15^{+}hours-a-week), and full/part-time student. Sixty-eight pairs were excluded where neither twin reported any such activities. When pairs included only one working sibling, spillover and personality information was included, if available, for the working twin and only the personality information, if available, for the non-working twin. Because family can include larger networks of siblings, parents and other relatives, we did not exclude participants on the basis of marital/parental status (Grzywacz and Marks, 2000).

After these exclusions, the present study included 533 twin pairs (*n*=1066 individuals) and 77 individuals whose co-twin did not participate (totaling 1143 participants). From pairs where both twins provided information, 335 pairs had complete spillover and personality data for both twins, including 191 monozygotic (MZ) pairs and 144 dizygotic (DZ) intact pairs (for zygosity determination, see Nichols & Bilbro, 1966; Kessler et al., 2004). The remaining 198 pairs had partial data (e.g., spillover and personality data for one twin and only personality information for the co-twin).

The sample included slightly more women (56%) than men (44%) and ranged from 25-to-73 years-old (*M*=43.89,*SD*=11.42). The ethnic breakdown included Caucasian=92.0%, African-American=4.5%, Native-American/Eskimo=0.8%, multiracial=0.3%, other=1.0%, and unreported=1.6%. The majority of the sample reported at least one work-related activity (89.5%) and was married (74.7%).

Measures

Spillover—Spillover variables were assessed from a scale developed for the MIDUS survey that has been used successfully in prior research and that captures four distinct spillover domains: NWF, NFW, PWF and PFW (Grzywacz & Marks, 2000). Respondents reported on a 5-item scale from 1(*all of the time*)-5(*never*) how often they experienced each of the 16 items in the past year. Items were reverse-scored, such that higher scores indicated higher spillover values, and averaged to form four overall spillover scores. Individuals missing three of the four items did not receive a score.

NWF items included: a)job reduces the effort you can give to activities at home; b)stress at work makes you irritable at home; c)your job makes you feel too tired to do the things that need attention at home; d)job worries/problems distract you when you are at home (α=.81).

NFW items included: a)responsibilities at home reduce the effort you can devote to your job; b)personal/family worries and problems distract you when you are at work; c)activities and chores at home prevent you from getting the amount of sleep you need to do your job well; d) stress at home makes you irritable at work (α=.78).

PWF items included: a)things you do at work help you deal with personal and practical issues at home; b)things you do at work make you a more interesting person at home; c)having a good day on your job makes you a better companion when you get home; d)skills you use on your job are useful for things you have to do at home (α=.73). Based on analyses establishing the psychometric properties of this spillover scale (Grzywacz & Marks, 2000), we eliminated item c based on its poor discriminate ability from the other spillover factors.

PFW items included: a)talking with someone at home helps you deal with problems at work; b)providing for what is needed at home makes you work harder at your job; c)love and respect you get at home makes you feel confident about yourself at work; and d)home life helps you relax and feel ready for the next day's work (α=.66[1]). Item b was excluded based on the scale construction established by Grzywacz & Marks (2000).

Personality—Neuroticism and extraversion were assessed by the Midlife Development Inventory Big Five Personality Scale (for validity description see Brim, Ryff, & Kessler,

2004) used successfully in prior research (e.g., Weiss, Bates, & Luciano, 2008). Participants reported on a 4-point scale from 1(*a lot*)-4(*not at all*) how well each of the personality items described them, and items were averaged together to form two overall personality scores. For each scale, items were reverse-scored such that higher scores indicated higher levels of each personality trait. Neuroticism-items included: moody, worrying, nervous, calm-*reverse-scored* (α=.78). Extraversion-items included: outgoing, friendly, lively, active, talkative (α=.76).

Analytical Approach

Univariate behavioral genetic analyses were used to estimate simultaneously the relative additive genetic (A), shared environmental (C), and unique environmental (E) variance components using the maximum-likelihood estimation of the raw data in Mx (Neale, 1997). A refers to the sum of the average effect of all segregating genes that influence a trait. MZ twins are genetically identical, sharing 100% of their genes, whereas DZ twins share on average 50% of their segregating genes. C refers to shared aspects of the environment that contribute to within-twin similarity, and thus both MZ and DZ twins share 100% of this variance with their co-twins. E refers to aspects of the environment unique to each person that contribute to within-twin dissimilarity and error variance, and thus twins within a pair share none of this variance. For each phenotype, full ACE models were compared to nested models with fewer parameters (AE, CE, or E) to determine whether parameters can be dropped without resulting in a significantly worse fit, as indicated by a significant increase in chi-square (χ^2).

Cholesky models assessed the extent to which genetic and environmental effects account for covariances between personality and spillover *and* variances unique to spillover (Neale & Cardon, 1992). ACE models were fit to the raw data using Mx (Neale, 1997). Figure 1 illustrates the additive genetic (A) and unique environmental (E) effects of a four-phenotype Cholesky model (C effects follow the same rules). The four-phenotype model decomposes phenotypic variance into (A_1,C_1,E_1) influences shared by $phenotype_1$, $phenotype_2$, $phenotype_3$ and $phenotype_4$. Variance shared by $phenotype_2$, $phenotype_3$ and $phenotype_4$ (controlling for $phenotype_1$) is partialled into three additional factors (A_2,C_2,E_2). Additional variance shared by $phenotype_3$ and $phenotype_4$ (controlling for $phenotype_1$ and $phenotype_2$) is partialled into three factors (A_3,C_3,E_3). The remaining variance, specific to $phenotype_4$, is partialled into A_4,C_4,E_4 variance components. In the present study two four-phenotype models were examined, including model a: extraversion, neuroticism, NWF and NFW and model b: neuroticism, extraversion, PWF and PFW.

In each model, personality was entered before spillover to examine whether neuroticism and extraversion share genetic and environmental variance with spillover. For model a, neuroticism was entered second (after extraversion) to examine its unique association with NWF and NFW because neuroticism is the personality trait most closely aligned to negative mood. Extraversion was reverse-coded in model a (higher levels=lower extraversion) to be positively associated with neuroticism, NWF and NFW. Reverse-coding does not change the strength or meaning of the associations between parameters but allows for easier interpretation of these associations. In model b, extraversion was entered second to examine its potential association with PWF and PFW beyond that shared with the other personality trait. Neuroticism was reverse-coded in model b (higher levels=greater emotional stability) to be positively associated with extraversion, PFW and PFW.

For each model, values of the parameter estimates were constrained to non-negative values. ACE models were compared to reduced AE, CE and E sub-models to determine whether parameters can be dropped without significant increases in χ^2 estimates. We also examined the Akaike's Information Criterion (AIC; Akaike, 1983) and the Bayesian Information Criterion (BIC; Raferty, 1995) fits. AIC measures model fit relative to parsimony. BIC measures the model minus the product of the degrees of freedom and the natural log of the sample size, thus taking sample size into account. Smaller AICs and BICs indicate a better fit.

Results

Table 1 provides descriptive statistics and phenotypic correlations for personality, negative work-to-family (NWF), negative family-to-work, positive work-to-family (PWF) and positive family-to-work (PFW) spillover. Information on sex, age and education is also included in Table 1. Higher neuroticism and lower extraversion are associated with higher NWF and NFW and lower PWF and PFW. Intra-class and cross-trait correlations are shown in Table 2. Each variable yielded MZ correlations higher in magnitude than the DZ correlations, suggesting the presence of genetic variance.

Assumption tests (Mx, Neale, 1997) showed no difference in means or variances within/between twin groups for the personality and spillover phenotypes. Next, univariate ACE models assessed the genetic and environmental influences on personality and spillover, controlling for sex, age and education. The C parameter estimate could be dropped from each univariate model, but models dropping both A and C parameter estimates yielded significantly worse fits for each personality and spillover variable as indicated by significant increases in χ^2. AE models offered the best fit to the data for each phenotype, suggesting that variance of the phenotypes is accounted for by additive genetic and unique environmental effects. Table 3 includes results for the full and best-fitting models. Additive genetic effects accounted for 50 and 40% of the variance of neuroticism and extraversion, respectively. Additive genetic effects also contributed to variation in each spillover phenotype (i.e., NWF=26%, NFW=18%, PWF=29%, PFW=28%) and unique environmental variance accounted for the remaining variance.

Cholesky models estimated genetic and environmental covariances between personality and spillover, controlling for sex, age and education. Full ACE models were followed by the nested models to determine whether C, A or both parameters could be dropped. Every C parameter could be dropped from model a and model b. Thus, AE models offered the best fit to the data, suggesting that genetic and unique environmental effects account for the phenotypic variances and covariances. Table 4 displays the fits statstics for model a and model b, respectively. The nested submodels provide better fits to the data as indicated by the non-significant change in $-2LL$ and AIC fit indices. Furthermore, standardized path coefficients for model a and model b are displayed in Figures 1 and 2, respectively.

For model a, the genetic factor common to personality and negative spillover (A_1) accounted for 41% of the additive genetic covariance between NWF and NFW. An additional genetic factor, independent of personality (A_3), accounted for the remaining additive genetic covariance between NWF and NFW. Furthermore, a non-shared environmental factor common to personality and negative spillover (E_1) accounted for 18% of the unique environmental covariance between NWF and NFW, and a unique environmental factor independent of personality was explained (E_3) contributed to the remaining unique environmental covariance between NWF and NFW.

A different pattern of results emerged for model b. Specifically, the additive genetic covariance between PWF and PFW was entirely explained by factor (A_2) shared in common with extraversion. Moreover, the unique environmental variance shared between PWF and PFW was entirely accounted for by a factor (E_3) independent of both neuroticism and extraversion.

Discussion

The present study suggests that prolonged negative and positive mood spillover between work and family domains represent individual-difference characteristics, and that neuroticism and extraversion are associated with these tendencies. Genetic effects contribute to a relationship between personality and prolonged negative mood and to the covariance specific to NWF and NFW. Unique environmental effects further explain an association between neuroticism, NWF and NFW and to the covariance specific to NWF and NFW. In a separate model, genetic effects contribute to associations between personality and positive mood spillover and to variance unique to PWF and PFW. Unique environmental effects further contribute to extraversion, PWF and PFW and to covariance specific to PWF and PFW. Neuroticism and extraversion together are associated with negative mood spillover, associations that are partially attributable to shared genetic variance.[2]

What then are the processes that may explain shared genetic variance between personality traits, NWF and NFW? Consistent with indirect-spillover models, one explanation is that genetic effects shape personality-related traits that lead to higher neuroticism, lower extraversion and prolonged negative mood. These underlying tendencies may include such experiences as negative emotional reactivity and lower positive affect. Another explanation is that genetic effects contributing to both neuroticism and extraversion shape consistent levels of negative mood both at work and at home, as posited by the congruence model (Frone et al., 1994). Alternatively, a gene-environment correlation (Scarr & McCartney, 1983), whereby personality traits influence the kinds of environments people evoke or seek out may be plausible. The genetic variance of neuroticism and extraversion has been shown to mediate the occurrence of undesirable life events (Saudino, Pederson, Lichtenstein, McClearn, & Plomin, 1997) which may, in turn, contribute to prolonged negative mood.

Negative spillover also retained genetic variance independent of personality. Perhaps genetic effects giving rise to prolonged negative thoughts (e.g., rumination) partially mediate the onset of negative mood spillover. Consistent with this speculation, rumination has been discussed as a precursor to negative emotions of anxiety and depressive symptoms (Nolen-hoeksema, 2000).

Unique environmental variance also accounts for associations between neuroticism, NWF and NFW. Reasons for environmental effects may include experiences unique to each twin-sibling within the early rearing environment (Plomin, Asbury, & Dunn, 2001). Preferential treatment for one twin-sibling, for example, may shape both neuroticism and tendencies to prolong negative mood-states in the less preferred twin-sibling. This is consistent with studies indicating that preferential parental treatment is associated with greater depression and anxiety among the less preferred sibling (e.g., McHale & Pawletko, 1989). Chronic stressors may also shape these relationships in adulthood. Managing a chronic condition/illness, for example, may foster neuroticism and emotional susceptibilities to stressors at work and home.

Unique environmental effects explain the covariance between NWF and NFW independent of personality. Unique environmental effects may be explained by acute stressors (e.g., getting stuck in traffic) that contribute to prolonged negative emotional states, without changing people's overall personality. Using daily diary methodology Williams and Alliger (1994) showed that day-to-day experiences influence emotional spillover. Similarly, daily events may also buffer NWF and NFW (e.g., keeping daily checklists).

[2]Although neuroticism and extraversion are distinct constructs (e.g., Eysenck,1963), studies show that they are moderately correlated (e.g., Judge, Erez, Bono, & Thoreson,2002). The association observed in the current study (r=-.19,$p \leq$.01) leaves a high degree of unexplained variance of each trait.

Extraversion shares genetic effects with both positive spillover measures. A possible explanation is that genetic effects responsible for variation in extraversion promote tendencies to sustain positive emotional experiences that carry between work and home (consistent with the indirect spillover model; Lambert, 1990). Also, positive emotions that are characteristic of extraversion may persist regardless of the domain of origin (consistent with the congruence model; Frone et al., 1994). A gene-environment correlation may also play a role (Scarr & McCartney, 1983). Saudino and colleagues (1997) demonstrated that the genetic variance of extraversion mediates the occurrence of controllable/desirable events which may consequently foster prolonged positive mood. Furthermore, there is genetic variance specific to each positive spillover variable. Perhaps genetic influences shaping characteristics that are particularly beneficial at work and home (e.g., tendency to succeed at work or to be satisfied with familial relationships, respectively) partially govern prolonged positive mood originating in each domain.

Unique environmental effects account for additional covariance between PWF and PFW independent of personality. Explanations may include a recent rewarding event that fosters positive emotions both at work and home without influencing personality. Because these environmental bases are not tied to neuroticism or extraversion, interventions designed to increase prolonged positive mood may be especially viable.

Limitations

The sample was predominately Caucasian and may not generalize to other populations. Further, prolonged mood-states were captured by self-reported measures (e.g., NFW and NWF), which may bias the relationships under investigation (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). A future direction might be to assess within- and between-individual effects using an experience-sampling design (e.g., Judge, Ilies, & Scott, 2005) using a genetically-informative sample to assess mood-states directly at work and home. Additionally, we assessed main effects rather than gene-environment correlations or interactions.

Despite these limitations, results offer implications when studying spillover phenomena. These data provide evidence that genetic factors associated with prolonged mood involves the genes that have been tied to neuroticism and extraversion *and* genes independent of these constructs. Results also suggest that interventions for reducing prolonged negative and enhancing positive mood can be more beneficial when taking into account both people's heritable personality traits as well as unique aspects in the work and home domains (e.g., daily events and stressors).

In closing, some individuals can compartmentalize emotions, whereas others are prone to carry their moods across domains, allowing them to impact work and home life, as depicted by the classic “kicking the dog” metaphor. The present study illuminates the origins of these tendencies and the importance of further research to unravel the bases of individual differences in prolonged mood.

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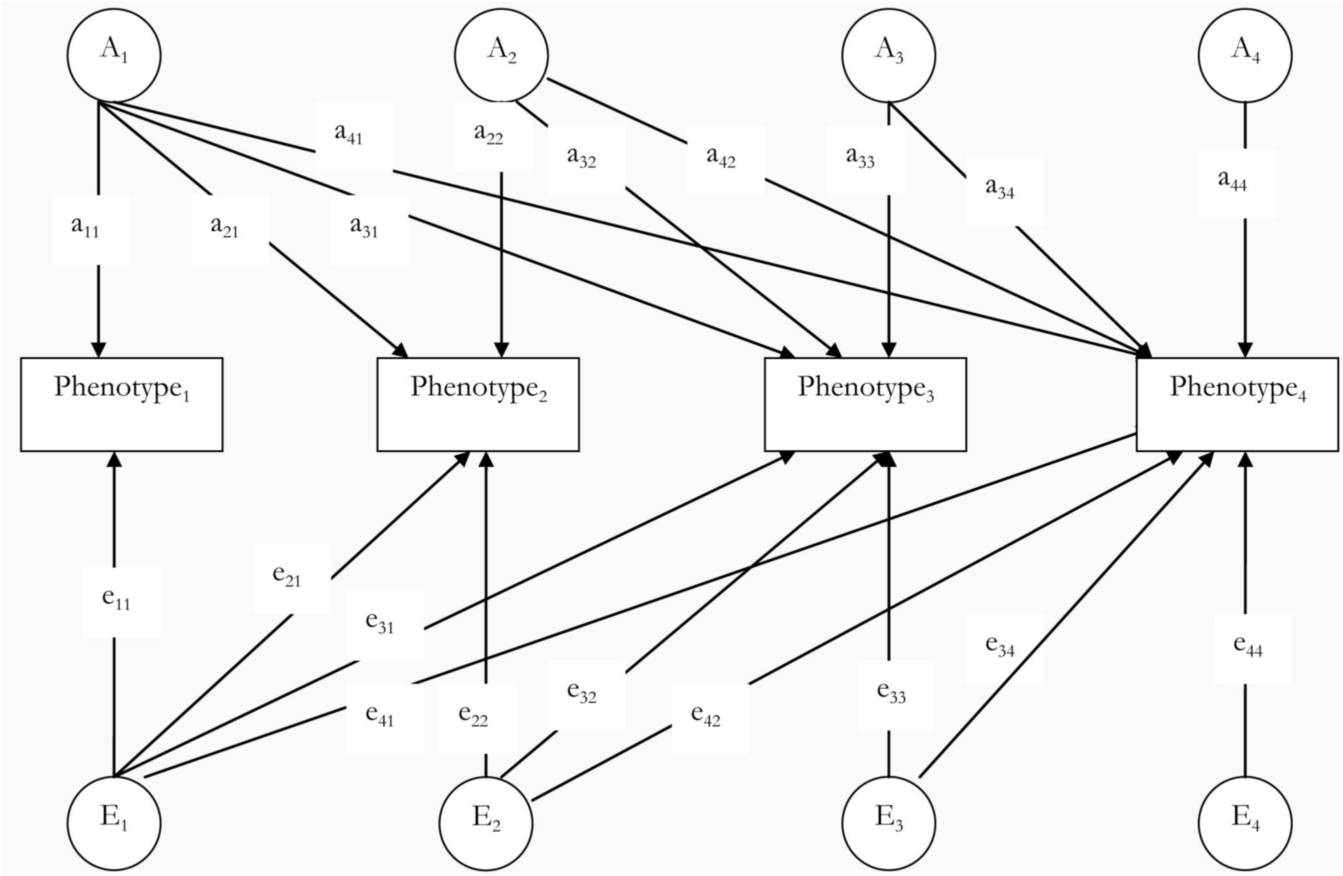

Figure 1.
Sample Cholesky Model

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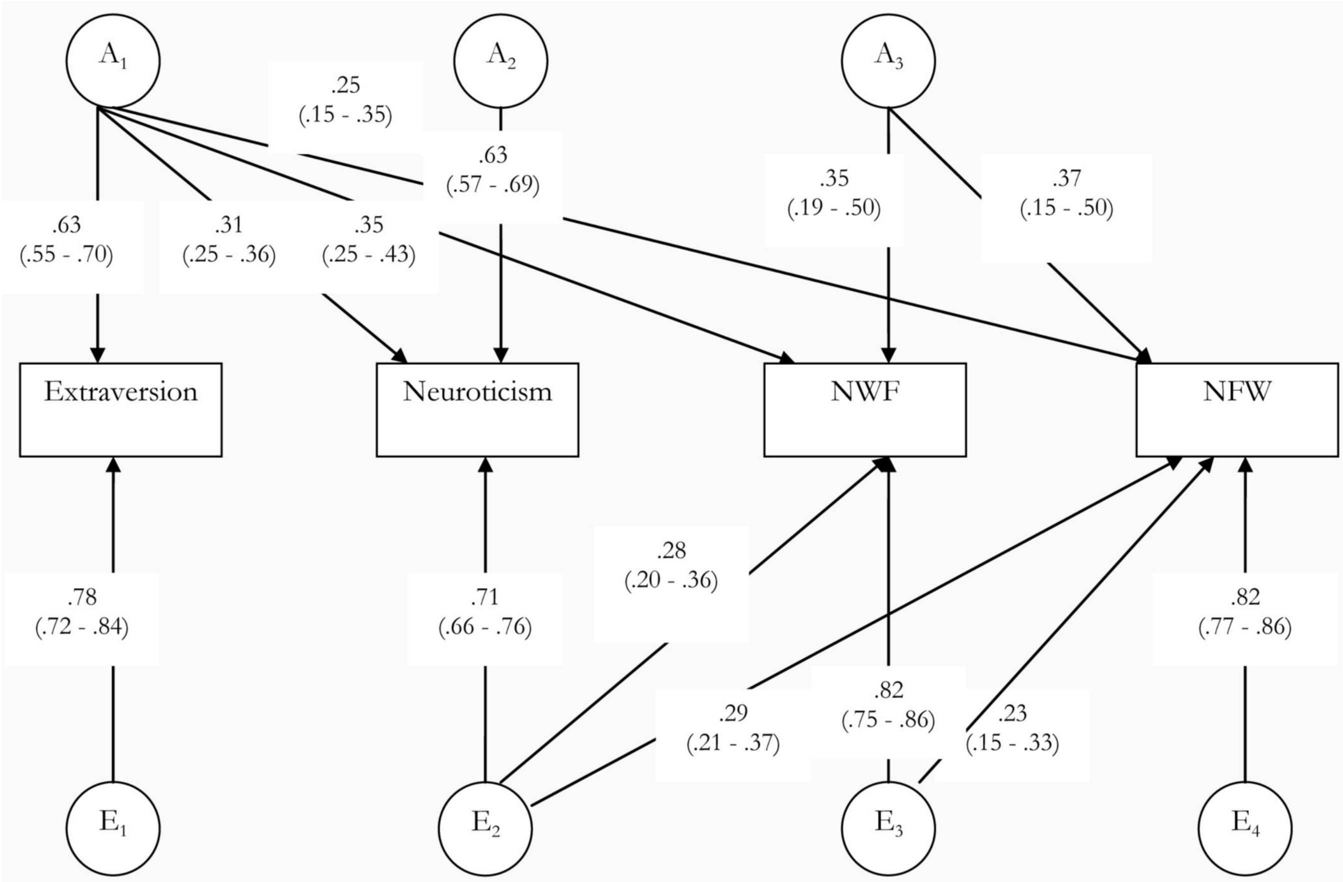

Figure 2.
Standardized Parameter Estimates for Personality, NWF and NFW

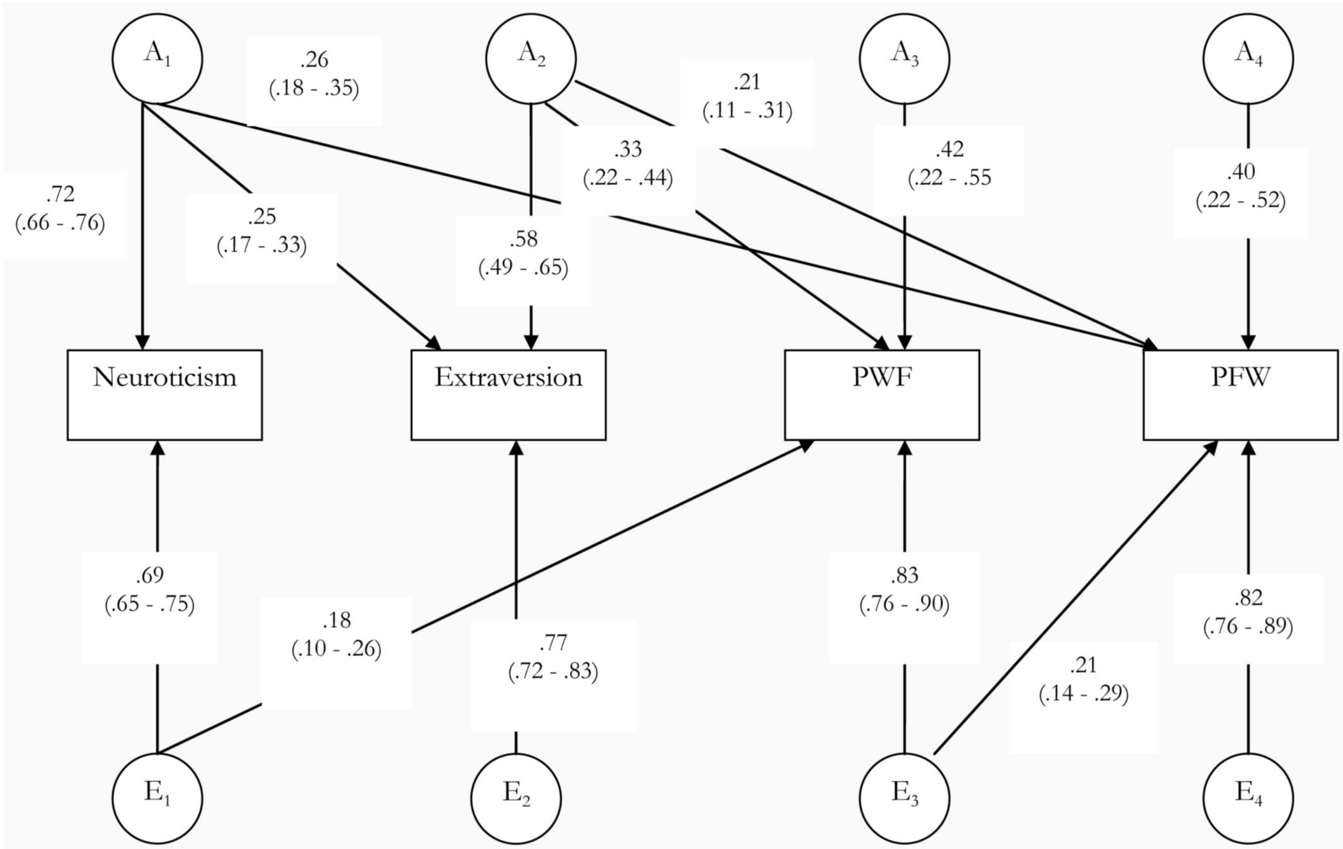

Figure 3.
Standardized Parameter Estimates for Personality, PWF and PFW

Table 1

Basic Statistics

	Descriptive Statistics				Phenotypic Correlations								
	N	**Range**	**Mean**	***SD***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1.Neuroticism	1139	1.00-4.00	2.25	0.67	-								
2.Extraversion	1139	1.40-4.00	3.23	0.56	−0.19**	-							
3.NWF	902	1.00-5.00	2.54	0.68	0.32**	−0.23**	-						
4.NFW	902	1.00-4.75	2.03	0.59	0.29**	−0.14**	0.51**	-					
5.PWF	902	1.00-5.00	2.61	0.83	−0.14**	0.23**	0.05	0.08*	-				
6.PFW	898	1.00-5.00	3.45	0.77	−0.22**	0.20**	−0.04	−0.10**	0.26**	-			
7.Sex					0.05	0.08*	−0.06	0.05	0.01	−0.05	-		
Men(1)	503												
Women(2)	640												
8.Age	1143	25.00-73.00	43.89	11.42	−0.14**	0.05	−0.19**	−0.24**	0.06	0.07*	−0.02	-	
9.Education	1142	1.00-12.00	6.72	2.37	−0.11**	0.02	0.13**	0.07*	0.13**	0.03	−0.11**	−0.12**	-

Note. *N*=sample size. *SD*=standard deviation. Men(1), Women(2)=MIDUS scored men as 1 and women as 2. For education: 1=no high school; 6=1-2 years of college; 12=professional degree/Ph.D.

* $p \leq .05$,

** $p \leq .01$.

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Table 2

Cross-twin Cross-trait Correlations by Zygosity with MZ Twin Pairs above the Diagonal and DZ Pairs Below

	1	2	3	4	5	6
1.Neuroticism	**.55**** **.22****	−.17**	.20**	.22**	−.01	−.24**
2.Extraversion	.03	**.44**** **.10**	−.19**	−.19**	.16**	.16**
3.NWF	.09	.00	**.31**** **.09**	.24**	.06	−.03
4.NFW	.12*	−.14*	.06	**.27**** **.02**	.18**	−.01
5.PWF	.02	.09	.13	−.02	**.30**** **.16**	.12**
6.PFW	−.06	.12*	.06	−.08	.06	**.50**** **.38****

* $p \leq .05$

** $p \leq .01$.

Table 3

Univariate Model Fitting Results

	Proportion of variance								
	A	**C**	**E**	***−2LL***	***AIC***	***df***	**$\Delta\chi^2$**	***Δdf***	***p***
Neuroticism	0.50	0.00	0.50	2023.30	−82.70	1053	-	-	-
	0.50	**-**	**0.50**	**2023.30**	**−84.70**	**1054**	**0.00**	**1**	**1.000**
	-	0.39	0.61	2039.22	−68.78	1054	15.92	1	0.000
	-	-	1.00	2125.94	15.94	1055	102.65	2	0.000
Extraversion	0.40	0.00	0.60	1708.69	−397.32	1053	-	-	-
	0.40	**-**	**0.60**	1708.69	**−399.32**	**1054**	**0.00**	**1**	**1.000**
	-	0.29	0.71	1722.30	−385.70	1054	13.62	1	0.000
	-	-	1.00	1767.03	−342.97	1055	58.34	2	0.000
NWF	0.26	0.00	0.74	1623.64	−34.56	829	-	-	-
	0.26	**-**	**0.74**	**1623.27**	**−36.36**	**830**	**0.00**	**1**	**1.000**
	-	0.18	0.82	1627.27	−32.73	830	3.63	1	**0.057**
	-	-	1.00	1638.06	−23.95	831	14.42	2	**0.001**
NFW	0.18	0.00	0.82	1396.04	−261.96	829	-	-	-
	0.18	**-**	**0.82**	**1396.04**	**−263.96**	**830**	**0.00**	**1**	**1.000**
	-	0.13	0.87	1398.23	−261.77	830	2.19	1	0.139
	-	-	1.00	1404.20	−257.80	831	8.16	2	0.017
PWF	0.27	0.02	0.71	2021.34	363.34	829	-	-	-
	0.29	**-**	**0.71**	**2021.35**	**361.35**	**830**	**0.01**	**1**	**0.922**
	-	0.23	0.77	2023.00	363.00	830	1.65	1	0.198
	-	-	1.00	2039.90	377.90	829	18.56	2	0.000
PFW	0.28	0.00	0.72	1891.13	239.13	826	-	-	-
	0.28	**-**	**0.72**	**1891.13**	**237.13**	**827**	**0.00**	**1**	**1.000**
	-	0.21	0.79	1894.39	240.39	827	3.26	1	0.071
	-	-	1.00	1909.28	253.28	828	18.15	2	0.000

Note. Best-fitting models in bold-type.

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Table 4

Multivariate Modeling for Personality and Spillover

	Goodness of fit							
	−2LL	***df***	***AIC***	***BIC***	$\Delta\chi^2$	Δdf	ΔAIC	***p***
Model a								
Full model	6366.65	3746	−1125.35	−8572.83				
Best-fitting model	6382.26	3762	−1141.74	−8615.24	15.60	16	−16.40	0.48
Model b								
Full model	7455.26	3743	−30.74	−8019.11				
Best-fitting model	7467.66	3759	−50.34	−8063.12	12.40	16	−19.60	0.72

Note. $\Delta \chi^2$, Δdf, ΔAIC=difference in χ^2,*df*, and *AIC* between full and best-fitting models.