Sources of Individual Differences in Sociopolitical Orientations:
Findings from Combining Behavior Genetic with Multi-Rater Approaches

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Alexandra Zapko-Willmes

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Erstgutachter: Prof. Dr. Rainer Riemann, Universität Bielefeld
Zweitgutachter und Betreuer: Prof. Dr. Christian Kandler, Universität Bremen

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**Die Personen wurden informiert.

Content

Summary

In the three studies constituting this dissertation, behavior genetic and multi-rater approaches were combined to contribute to the understanding of sources of interindividual differences in broad and narrow dimensions of sociopolitical orientations. For this purpose, all studies employed structural equation modeling designs based on cross-sectional twin family and multi-rater data from the Jena Twin Study of Social Attitudes (JeTSSA; studies 1 and 2) and the Study of Personality Architecture and Dynamics (SPeADy; study 3).

Study 1 was aimed at validating and extending previous self-report studies on genetic and environmental sources of individual differences in homophobic tendencies towards gay men across multiple rater perspectives. In line with our hypotheses, we found a large proportion of genetic factors (82%) to contribute to individual differences in homophobia, with unique environmental factors (18%) explaining the remaining variance. Moreover, we found variance specific for self-reports to be partially attributable to genetic factors (20%), confirming past findings that suggested that self-reports may underlie genetic influences. Results indicate the importance of univariate behavior genetic investigations.

Study 2 was conducted to examine, whether differences in experienced parenting affect present differences in twin sibling's right-wing authoritarianism (RWA) via a "truly" environmental pathway as opposed to a genetic mediation. We integrated genetically informed and phenotypic multi-rater models to investigate whether and how the association is confounded due to shared genetic and environmental sources of both variables. We considered offspring's, mothers', and fathers' retrospective ratings of two parenting dimensions and offspring's self- and informant reports on their RWA. Our hypotheses were generally not confirmed. An evocative genotype-environment correlation likely explained the positive link between parental responsiveness and differences in offspring's RWA. In other words, the offspring's genetically influenced RWA score (and associated behavior) affected their experienced parental emotional warmth and support, with a higher RWA score associated with more highly experienced responsiveness. In contrast, we found an effectively environmental positive association between differences in experienced parental demandingness and differences in twin sibling's RWA. Parental RWA, while not associated with parental responsiveness, partly explained the link between experienced demandingness and differences in offspring's RWA. Findings underlined the additional insight gained through multiple raters on the environmental as well as characteristic.

Finally, study 3 examined the convergence of basic value orientations and foci of moral concern as two abstract dimensions of sociopolitical orientations. We expected the dimensions to converge based on common underlying world beliefs. The value orientation towards conservation versus openness to change was expected to converge with a moral focus on organization versus opportunity due to the underlying belief in a dangerous world. The value orientation self-transcendence versus self-enhancement was expected to converge with a moral

focus on social versus individual outcomes due to the underlying (lack of) belief in a competitive world. We combined multi-rater with twin family data to investigate four criteria of convergence (structural, age-related, source-related, and the link with a key personality trait). For both expected links, we found the dimensions to be systematically linked, but reflect distinct characteristics, suggesting that they reflect characteristics of different personality layers. We discussed the role of specific motives and environmental factors contributing to differences in foci of moral concern.

Introduction

According to an old saying and etiquette rule[1], one should avoid conversations about political topics, alluding to the inevitably ensuing disputes fueled by individual differences in social and political views. When viewed through historic and current events, these interindividual differences may have major individual-level, group-level, societal, and even global consequences beyond mere heated disputes. Individual preferences regarding social and political issues, subsumed under the term *sociopolitical orientations*, have been linked to various forms of prejudice (Altemeyer, 1996; Asbrock, Sibley, & Duckitt, 2010; Duckitt & Farre, 1994; Ekehammar, Akrami, Gylje, & Zakrisson, 2004; Hodson & Dhont, 2015), support for radical right parties (Aichholzer & Zandonella, 2016; Cornelis & Van Hiel, 2015; but see also Dunn, 2015), endorsement of human rights and associated behavior (Cohrs, Maes, Moschner, & Kielmann, 2007), and post-9/11 attitudes (Crowson, DeBacker, & Thoma, 2005, 2006), to name a few. Furthermore, its impact could be recently observed in the context of political participation and voting behavior in the Brexit referendum (Golec de Zavala, Guerra, & Simão, 2017) as well as the US presidential election (Choma & Hanoch, 2017; Womick, Rothmund, Azevedo, King, & Jost, 2018).

These findings corroborate the importance of research on the factors that contribute to individual differences in sociopolitical orientations. An important piece of this puzzle is the identification of the biological and environmental roots of these characteristics. These roots have long been regarded as being essentially – even exclusively – environmental; Genetic explanations were largely disregarded in favor of socialization explanations (e.g., Adorno, Frenkel-Brunswik, Levinson, & Sanford, 1950; Altemeyer, 1988). However, behavior genetic studies (e.g., Eaves & Eysenck, 1974; Eaves et al., 1999; Kandler, Bleidorn, & Riemann, 2012; Martin et al., 1986) have shown that environmental factors shared between twin siblings (which would reflect a large portion of the argued socialization) are not as crucial as previously assumed, and that genetic and idiosyncratic environmental effects are substantial. After decades of neglecting genetic explanations, there is no longer a "nature versus nurture" debate when it comes to sources of individual differences in sociopolitical orientations, as well as other personality characteristics[2] and virtually all complex human dispositions (Polderman et al., 2015). Rather, nature and nurture are agreed to be interwoven with each other (Plomin, DeFries, & Loehlin, 1977; Scarr & McCartney, 1983).

In this work, I sought to contribute to the understanding of the sources of interindividual differences in sociopolitical orientations. Sociopolitical orientations were studied at various levels of content-related abstraction (**Section I**), ranging from specific dimensions (i.e., homophobia; study 1), to broad, less specific dimensions that capture individual global social

[1] "Never discuss politics or religion in polite company" (of unknown origin).

[2] In this dissertation, this term implies a variety of constructs for which individual differences were found, including personality traits, values, motives, attitudes, interests, cognitive ability, and so on. This is based on a broad concept of personality (Kandler, Zimmermann, & McAdams, 2014). Please note that the term *trait* is used to either refer to personality traits, when the cited study used this term (e.g., Polderman et al., 2015) or in a test theoretical context.

and political preferences (i.e., right-wing authoritarianism; study 2) to even more abstract motivational and affective-cognitive dimensions (i.e., value orientations and foci of moral concern; study 3). I employed both behavior genetic and multi-rater models to overcome methodological limitations (**Section II**) of past univariate (study 1) and multivariate (study 2) behavior genetic research, and to gain insight into the convergence of two conceptually related dimensions of sociopolitical orientations (study 3).

I. In a Nutshell: Sociopolitical Orientations

A number of researchers have suggested that two core dimensions capture the basic individual preferences underlying the expanse of specific social and political views as well as political or conservative ideology (e.g., Eysenck, 1954; Feldman & Johnston, 2014; Jost, Federico, & Napier, 2009; Jost, Glaser, Kruglanski, & Sulloway, 2003). Despite different labels, the proposed constructs imply the same two core dimensions of sociopolitical orientations: *resistance to change* and *acceptance of inequality*.

Resistance to change (also known as social, authoritarian or cultural conservatism, traditionalism vs. progressivism, or social ideology) reflects the individual advocacy for social change versus stability. This dimension has been closely linked to and equated with right-wing authoritarianism (RWA; Altemeyer, 1981, 1988, 1996; Funk et al, 2013; Ludeke, Johnson, & Bouchard, 2013) and value orientation conservation versus openness to change (Duckitt, 2001; Duckitt & Sibley &, 2017; Schwartz, 1992, 1994). Acceptance of inequality (also known as economic conservatism, hierarchy or elitism vs. egalitarianism, or economic ideology) represents the individual acceptance versus rejection of inequality. This dimension has been closely associated and equated with social dominance orientation (SDO; Pratto, Sidanius, Stallworth, & Malle, 1994) and value orientation self-transcendence versus self-enhancement (Duckitt, 2001; Duckitt & Sibley &, 2017; Feldman, 2003; Schwartz, 1992, 1994).

Several models have been developed to explain the antecedents and consequences of these core sociopolitical orientations. The two probably most established frameworks include both individual characteristics as well as factors of the sociocultural environment to explain sociopolitical orientations. According to the dual-process motivation model of ideological attitudes (Duckitt, 2001; Duckitt & Sibley, 2010, 2017), on which considerations of studies 2 and 3 are based, certain personality traits, world beliefs, and socialization factors shape individual differences in RWA and SDO, which in turn shape individual generalized prejudice as well as socially shared patterns of outgroup prejudices. Jost and colleagues (2003, 2009) described political ideology as motivated social cognition. Their motivated social–cognitive approach, picked up in study 3, includes three motives that shape the introduced core sociopolitical dimensions. These reflect core aspects of individual political (left/right) ideology, which further predicts the individual evaluation of diverse issues, parties, and political candidates, intergroup attitudes (i.e., narrow dimensions of sociopolitical orientations), and system justification.

II. Nature and Nurture of Sociopolitical Orientations

Individual differences in sociopolitical orientations received comparably little attention within the behavior genetic community. A meta-analyses of twin studies on human complex traits published between 1958 and 2012 showed that less than 1% of the included studies focused on social attitudinal constructs (19 of 2748 studies), with studies mainly covering clinical (31%), metabolic (12%) or cognitive (9%) "complex traits" (Polderman et al., 2015).

The works of Eaves and Eysenck (1974) and Martin et al. (1986) are generally regarded as having pathed the way for the scientific inquiry of genetic and environmental sources of individual differences in sociopolitical orientations. Eaves and Eysenck (1974) investigated radicalism versus conservatism and tough-mindedness versus tender-mindedness[3] in a British twin sample by use of a public opinions inventory. They found variation in both dimensions to be substantially attributable to genetic variation, in other words, *heritable* (65% and 54%, respectively). Martin et al. (1986) analyzed individual differences in conservatism, measured with the Wilson–Patterson conservatism scale in an Australian twin sample, and reported a similarly substantial heritability (62%)[4]. Several dozen twin, family, and adoption studies on sociopolitical orientations have since been published (see Table 1 for an overview of twin family studies, pp. 7–10; for non-twin adoption studies, see, for example, Abrahamson, Baker, & Caspi, 2002; Scarr & Weinberg, 1981).

The ensuing increase in publications occurred considerably later than in other research areas, such as personality trait research (Johnson, Vernon & Feiler, 2008). This may partly be due to academia's long-held conviction that sociopolitical orientations are primarily – even exclusively – shaped by socialization processes (e.g., Adorno, Frenkel-Brunswik, Levinson, & Sanford, 1950; Altemeyer, 1988; Converse, 1964/2006). This conviction went so far that behavior genetic studies initially included sociopolitical dimensions as "non-genetic controls" (Scarr & Weinberg, 1981). However, the exceeding evidence for a genetic basis (e.g., Eaves, Eysenck, & Martin, 1989) led to a gradual rethinking in the scientific community (for persevering critics of twin designs, see Charney, 2008; 2012; Shultziner, 2013). Furthermore, environmental factors contributing to individual differences in social and political views were mostly not shared between twin siblings reared together after they reached adulthood (Eaves et al., 1997; see also Hatemi et al., 2014; Polderman et al., 2015), casting doubt on the importance of (family) socialization. These findings apply to virtually all psychological characteristics (Polderman et al., 2015) and led to the postulation of three corresponding "laws of behavior genetics" (Turkheimer, 2000).

However, molecular genetic studies found genetic effects that are a quarter to half the size of the estimates based on twin studies for almost all psychological constructs, including core

[3] They did not regard tough-mindedness versus tender-mindedness as a sociopolitical orientation, but rather a personality trait.
[4] They also analyzed data used in Eaves & Eysenck (1974) and reported sex differences in heritability estimates on the shortened measure.

sociopolitical orientations (Benjamin et al., 2012). Researchers attributed this dilemma, termed the *missing heritability problem* (Maher, 2008; Manolio et al., 2009), to (a) effects of gene interactions within or across loci (i.e., non-additive genetic effects; Zuk, Hechter, Sunyaev, & Lander, 2012), (b) rare gene variants with large effects (Yang et al., 2015), (c) epigenetic factors (Trerotola, Relli, Simeone, & Alberti, 2015), and (d) an overestimation of heritability in twin studies (Charney, 2008). Moreover, small effect sizes and non-replicable findings of candidate-gene- and genome-wide-association-studies led to the conclusion that most phenotypes (i.e., observable characteristics) are polygenetic. In other words, their variation is partially attributable to a large number of genes and their interactions (Manolio et al., 2009; Yang et al., 2011).

The link between genotype and phenotype becomes more intricate when taking into account that genes and environments correlate and interact with each other (Plomin et al., 1977; Scarr & McCartney, 1983). These include genotype-environment correlations due to the fact that parents jointly provide the genetic make-up as well as a portion of the (social) environment of their offspring (i.e., a *passive* genotype-environment correlation), due to environmental (agentic) responses to genetically driven characteristics of an individual (i.e., an *evocative* genotype-environment correlation), and the exploration and avoidance of specific environments due to genetically influenced personality characteristics (i.e., an *active* genotype-environment correlation). Moreover, genotype and environments may interact with each other, leading to moderating effects of environmental factors on gene expression and regulation, and moderating effects of the genotype on the individual "susceptibility" to certain environmental factors (Plomin et al., 1977).

Probably due to the complexity of the matter, there are few models explaining the link between genetics and sociopolitical orientations. Smith, Oxley, Hibbing, Alford, and Hibbing (2011) cautiously proposed a model of six causally linked stages: Genes (stage 1) affecting biological functions and systems (stage 2), which in turn shape cognitive and emotional information processing (stage 3); These influence personality traits and values (stage 4) that form (political) ideological tendencies (stage 5), which eventually shape views on specific political and social issues (stage 6). Against this backdrop, they criticized the prevalent use of ideology as "a superficial label or bundle of topical positions" and pleaded for a conceptualization of ideology as "a central component of an individual's general life orientations", with political ideology as "the *political* manifestation of these deeper inclinations toward a variety of features of our existence" (p. 10; emphasis in original). They argued that a broader conceptualization and more intense investigations of attitudes towards current issues (stage 6) may assist in unveiling the contributions of nature and nurture to individual differences in such broad and narrow sociopolitical orientations.

Despite the complexity of the subject, behavior genetics may allow to gain insight into sources of individual differences in sociopolitical orientations, if it is imbedded in a methodologically elaborate design. One way to achieve this is to combine genetically informed data with multi-rater data.

Table 1. *Overview of Twin Studies on Sociopolitical Orientations.*

Dimension	C.	Data	Instrument	#I.	First author (publ. y.)	MZ	DZ
Resistance to change[a]							
Radicalism vs. conservatism	UK	ULVTR	Public Opinion Inventory	60	Eaves & Eysenck (1974)[b]	451	257
				40	Martin et al. (1986)[b]	445	380
Conservatism	AU	ATR (I)	W–P	50	Martin et al. (1986)[b] &	1797	2006
					Truett et al. (1992) &	1800	2010
					Loehlin (1993)[c]		
		ATR (I+II)	(Updated) W–P	27	Posner et al. (1996)[c]	1802	2006
					[also: Alford et al. (2005);		
					Hatemi et al. (2014)]		
		QTR	Scale in W–P format	28	Hatemi et al. (2014)	96	155
	US	MATR	VW–P	28	Eaves et al. (1999)[b]	2629	3033
					[also: Alford et al. (2005);		
					Hatemi et al. (2014)]		
		MATR (II)	VW–P	50	Hatemi et al. (2014)	836	778
		MCV TS & MATR	VW–P	28	Eaves et al. (1997)[b]	840	758
					[also: Hatemi et al. (2009)[b]]		
		MISTRA	Adapted W–P	28	Bouchard et al. (2004)	54	46
					Ludeke et al. (2013)	66	53
		MTR	Adapted W–P	27	Hatemi et al. (2014)	338	227
Traditionalism	US	MTR	MPQ–Trad.	27	Tellegen et al. (1988)	217	114
		MISTRA	MPQ–Trad.	27	Tellegen et al. (1988)	44	27
Right-wing authoritarianism	US	MTR	RWA Scale	30	McCourt et al. (1999) &	423	434
					Ludeke & Krueger (2013)		
		MTR (II)	RWA Scale (abbreviated)	15	Ludeke & Krueger (2013) &	27	183
					Hatemi et al. (2014)	5	
		MISTRA	RWA Scale	30	McCourt et al. (1999)	40	42
	DE	JeTSSA	RWA 3D Scale	12	Kandler et al. (2015a; 2016a)	226	168
Authoritarian beliefs	AU	QTR	Unlabeled scale	10	Hatemi et al. (2014)	96	155
Authoritarian values	US	MATR	Life Values index	11	Hatemi et al. (2014)	1007	714
Moral conservatism–liberalism	PO	Polish sample	Political Extremism Scale	16	Oniszczenko & Jakubowska (2005)[c]	119	123
Rejecting system change	DE	JeTSSA	Unlabeled scale	8	Kandler et al. (2012)[c]	224	156
Concern over norm maintenance	US	MIDUS II	MPQ–Trad.	3	Lewis & Bates (2014)	312	322
Resistance to change/ authoritarian conservatism	DE	JeTSSA	Several scales	25	Kandler et al. (2015b)	226	152
	US	MTR	Several scales	15	Kandler et al. (2015b)	356	240
	JP	Keio Twin Project	Several scales	10	Kandler et al. (2015b)	318	152
Openness to change vs. conservation	DE	CoSMoS	Portrait Values Questionnaire	30	Knafo & Spinath (2011)	271*	
					Kandler et al. (2016b)	138	261
Attitudes related to resistance to change							
Sexual permissiveness/ Sexual conservatism	US	MATR	VW–P	8	Eaves et al. (1999)[b]	2629	3033
		MISTRA	Adapted W–P	28	Bouchard et al. (2004)	54	46
Religious fundamentalism	US	MATR	VW–P	5	Eaves et al. (1999)[b]	2629	3033
Religiosity/social conservatism	CA	WOTP	Political attitude scale	8	Bell et al. (2009)	192	78
Acceptance of inequality							
Toughmindedness vs. tendermindedness	UK	ULVTR	Public Opinion Inventory	60	Eaves & Eysenck (1974)[b]	451	257
				40	Martin et al. (1986)[b]	445	380

Dimension	C.	Data	Instrument	#I.	First author (publ. y.)	MZ	DZ
Free market economy–state interventionism	PO	Polish sample	Political Extremism Scale	16	Oniszczenko & Jakubowska (2005)[c]	119	123
Economic equality	CA	WOTP	Political attitude scale	9	Bell et al. (2009)	192	78
Acceptance of inequality	DE	JeTSSA	Unlabeled scale	8	Kandler et al. (2012)[c]	224	156
Economic egalitarianism	AU	QTR	Bipolar item	1	Hatemi et al. (2014)	96	155
	US	MTR	Economic Egalitarianism measure	5	Hatemi et al. (2014)	347	229
Social dominance orientation/ Acceptance of inequality	DE	JeTSSA	SDO Scale	16	Kandler et al. (2015a; 2016a)	226	168
			Several scales	22	Kandler et al. (2015b)	226	152
	US	MTR	Several scales	9	Kandler et al. (2015b)	356	240
	JP	Keio Twin Project	Several scales	8	Kandler et al. (2015b)	318	152
Individualism-Collectivism	DK	Danish TR	Individualism-Collectivism index	5	Hatemi et al. (2014)	435	633
Self-transcendence vs. self-enhancement	DE	CoSMoS	Portrait Values Questionnaire	30	Knafo & Spinath (2011)	271*	
					Kandler et al. (2016b)	138	261
Attitudes related to acceptance of inequality							
Economic liberalism	US	MATR	VW–P	5	Eaves et al. (1999)[b]	2629	3033
Competition/business	CA	WOTP	Political attitude scale	3	Bell et al. (2009)	192	78
Economic policy opinions	SE	Swedish TR	Unlabeled scale	6	Oskarsson et al. (2015)	476	506
Redistribution policy opinions	SE	Swedish TR	Unlabeled scale	2	Oskarsson et al. (2015)	476	506
Conservative ideology[a]							
Global conservatism–liberalism (Composite score)	DK	Danish TR	Scale in W–P format	16	Hatemi et al. (2014)	435	633
	SE	Swedish TR	Unlabeled scale	34	Hatemi et al. (2014)	1143	2351
	DE	JeTSSA	Several scales	57	Kandler et al. (2015b)	226	152
	US	MTR	Several scales	26	Kandler et al. (2015b)	356	240
	JP	Keio Twin Project	Several scales	18	Kandler et al. (2015b)	318	152
Ideological self-placement	CA	WOTP	Left/liberal–right/ conservative	1	Bell et al. (2009)	192	78
	US	MTR	Liberal–conservative	1	Cranmer & Dawes (2012)[bc]	356	240
					& Stam et al. (2012)[bc]	331	220
	SE	Swedish TR	Left–right	1	Hatemi et al. (2014)	1143	2351
	HU	Hungarian twin sample	Left–right	1	Hatemi et al. (2014)	46	19
			Liberal–conservative	1	Hatemi et al. (2014)	46	19
Intergroup attitudes							
Attitudes toward equality (open-door immigration, separate roles for men and women, racial discrimination)	CA/ US	WOTP & UBCTP	Composite of attitude items	4	Olson et al. (2001)[bc]	195	141
Homophobia	AU	ATR (II)	Attitudes to Homosexuality scale	10	Verweij et al. (2008)[c]	929	893
Ethical/racial minorities	CA	WOTP	Political attitude scale	2	Bell et al. (2009)	192	78
Ethnocentrism	US	MTR	Thermometer ratings of in-/ out-group(s)	4	Orey & Park (2012)[b]	356	230

Dimension	C.	Data	Instrument	#I.	First author (publ. y.)	MZ	DZ
In-group favoritism	US	MIDUS II	Unlabeled scale	9	Lewis & Bates (2014)	312	322
					Lewis & Bates (2017)	224	305
Generalized (racial) prejudice	DE	JeTTSA	Unlabeled scale	7 7	Lewis et al. (2014) & Kandler et al. (2015a)	225	165
Narrow-sense xenophobia	DE	JeTSSA	Unlabeled scale	11	Kandler et al. (2015a)	226	168
Immigration policy opinions	SE	Swedish TR	Unlabeled scale	6	Oskarsson et al. (2015)	476	506
Race favoritism	US	MIDUS II	Unlabeled scale	3	Lewis & Bates (2017)	224	305
Ethnic favoritism	US	MIDUS II	Unlabeled scale	3	Lewis & Bates (2017)	224	305
Religious favoritism	US	MIDUS II	Unlabeled scale	3	Lewis & Bates (2017)	224	305
Other attitudes related to both dimensions[a]							
Nonreligious social attitudes	US	MTR	Unspecified items	14	Bouchard et al. (1990)[b]	42	/
		MISTRA				421	/
Political preference	US	MATR	VW–P	2	Eaves et al. (1999)[b]	2629	3033
Militarism	US	MATR	VW–P	5	Eaves et al. (1999)[b]	2629	3033
		MISTRA	Adapted W–P	28	Bouchard et al. (2004)	54	46
Social conservatism	US	MISTRA	Adapted W–P	28	Bouchard et al. (2004)	54	46
Activist state on social issues	CA	WOTP	Political attitude scale	6	Bell et al. (2009)	192	78
Environmentalism / Environmental policy opinions	CA	WOTP	Political attitude scale	8	Bell et al. (2009)	192	78
	SE	Swedish TR	Unlabeled scale	2	Oskarsson et al. (2015)	476	506
Conservatism	DE	BiLSAT	AVQ	10	Renner et al. (2012)	157	74
Intellectualism	DE	BiLSAT	AVQ	10	Renner et al. (2012)	157	74
Ideological constraint	US	MTR	Adapted W–P	14	Arceneaux et al. (2012)[bc]	356	240
Patriotism	DE	JeTTSA	Unlabeled scale	4	Lewis et al. (2014)	225	165
Nationalism	DE	JeTTSA	Unlabeled scale	4	Lewis et al. (2014)	225	165
Equality vs. freedom	DK	Danish TR	Freedom-Equality index	1	Hatemi et al. (2014)	435	633
Foreign policy opinions	SE	Swedish TR	Unlabeled scale	3	Oskarsson et al. (2015)	476	506

Notes. Included studies (were the first to) report univariate findings on the respective dimension in the respective sample. Studies considering informant reports on sociopolitical orientations are colored orange. C. = Country of used sample; #I. = Overall number of items in the instrument; MZ = Used monozygotic twin pairs; DZ = Used dizygotic twin pairs; First author (publ. y.) =First author and publication year of the study (in case of two authors, both names are shown); RWA = Right-Wing Authoritarianism; W–P = Wilson–Patterson conservatism scale; VW–P = A modified (Virginia 30K) version of W–P; MPQ = Multidimensional Personality Questionnaire; MPQ–Trad. = Traditionalism scale of MPQ. AVQ = Austrian Value Questionnaire. **Abbreviations of data sources:** ULVTR = University of London Institute of Psychiatry Volunteer Twin Registry; MTR = Minnesota Twin Family Registry; MTR (II) = Follow-up sample of MTR; MISTRA = Minnesota Study of Twins Reared Apart; JeTTSA = Jena Twin Study of Social Attitudes; CoSMoS = German twin study on Cognitive Ability, Self-Reported Motivation, and School Achievement; QTR = Queensland Twin and Family Registry; MATR = United States Mid Atlantic Twin Registry (former Virginia 30K); MATR (II) = United States Health Habits and Opinions Study, follow-up of MATR; MIDUS II = MacArthur Foundation Survey of Midlife Development in the United States; TR = Twin Registry; WOTP = Western Ontario Twin Project; UBCTP = University of British Columbia Twin Project; ATR (I) = Australian National Health and Medical Research Council Twin Registry; ATR (II) = Follow-up sample of ATR (I); MCV TS = Medical College of Virginia Cardiovascular Twin Study; BiLSAT = Bielefeld Longitudinal Study of Adult Twins. Country names are presented in ISO 3166-1 encoding. **Not included in the overview:** (1) Analyses of single items within inventories (e.g., Alford et al., 2005; Cranmer & Dawes, 2012; Eaves et al., 1999; Eaves & Hatemi, 2008; Hatemi et al., 2010; Martin et al., 1986; Stam et al., 2012), (2) constructs related to sociopolitical orientations, such as specific values (e.g., Keller, Bouchard, Arvey, Segal, & Dawis, 1992; Schermer, Feather, Zhu, & Martin, 2008; Schermer, Vernon, Maio, & Jang, 2011), communitarian beliefs (Figueredo, Vasquez, Brumbach, & Schneider, 2004), discriminatory intent (Kandler et al., 2015a), political interest (e.g., Klemmensen et al., 2012; Weinschenk & Dawes, 2017), political sophistication (Arceneaux et al., 2012), political and social participation

(e.g., Fowler, Baker, & Dawes, 2018; Kornadt, Hufer, Kandler, & Riemann, 2018), party identification (Bell & Kandler, 2015; Settle, Dawes, & Fowler, 2009), voting preference (Hatemi, Medland, Morley, Heath, & Martin, 2007), and religiosity (e.g., D'Onofrio, Eaves, Jurrelle, Maes, & Spilka, 1999; Kendler et al., 2003; Truett et al., 1992; Waller, Kojetin, Bouchard, Lykken, & Tellegen, 1990), and (3) studies including (identical) re-analyses of the same data.
*No available information on pair distribution.
[a]Studies on "conservatism" are listed under "resistance to change", "conservative ideology", or "other attitudes related to both dimensions" based on Wilson's (1973), Jost et al.'s (2003), and (if available) the authors' suggestions, and item content (i.e., the proportion of items reflecting resistance to change and acceptance of inequality).
[b]Studies considered in the review of Hatemi & McDermott (2012).
[c]Studies considered in the meta-analyses of Polderman et al. (2015).

III. Integrative Approaches of Behavior Genetic and Multiple Rater Perspectives

Self-reports are probably the most widely used method in psychological research to assess the variation in a large number of human characteristics. This also holds true to behavior genetic studies on the sources of said variation. To the best of my knowledge, only one behavior genetic study employed multiple rater perspectives on sociopolitical orientations (Kandler et al., 2016, see Table 1).

Self-report data offer a number of advantages. Their collection is time- and cost-efficient and their interpretation is straightforward. Self-raters have the most comprehensive (and partially exclusive) access to their thoughts, feelings, experiences, and behavior. Moreover, they are presumably motivated to provide a thorough self-assessment, and the self-perception conveyed through the rating itself potentially provides additional valid information (Paulhus & Vazire, 2007; Vazire & Mehl, 2008).

However, there are some shortcomings in relying solely on self-reports. Self-reports may underlie response biases that distort measurement of the characteristic of interest (e.g., Hoyt, 2000; Paulhus, 1991). These response tendencies may not be related to item content, such as (dis)acquiescent, midpoint or extreme responding, and content-dependent, such as socially desirable responding (Baumgartner & Steenkamp, 2001). Whether deliberately (impression management) or unwittingly (self-deception), socially desirable responding, defined as "the tendency to give positive self-descriptions" (Paulhus, 2002; p. 49), may be particularly adverse for the assessment of sociopolitical orientations, as expressing certain social and political attitudes may be socially (un)desirable. While informant reports may also be affected by content-independent response tendencies, they are less affected by the social (un)desirability of the rated characteristic itself (e.g., Altemeyer, 1996). Additionally, people's sociopolitical orientations may affect their self-assessment of other characteristics due to the perceived desirability of the rated characteristic (Ludeke, Tagar, & DeYoung, 2016), as well as their assessment of other aspects, such as family environment and experiences (Harden, 2014; Kendler & Baker, 2007).

Relying on a single method may have negative consequences for the accuracy of genetic and environmental estimations within behavior genetic studies. The described response tendencies of self-reports may lead to skewed heritability estimates, since they were found to be heritable themselves (Kandler, Riemann, Spinath, & Angleitner, 2010). Consequently, univariate and bivariate behavior genetic findings may overestimate genetic effects of the characteristic of interest and the genetic correlation between two characteristics respectively. In addition, "truly" unique environmental factors cannot be disentangled from measurement error variance, resulting in an inflated estimate of idiosyncratic environmental influences.

Combining self-reports with other methods, such as informant reports, helps overcoming these issues to some extent. While they also may underlie certain response tendencies

(Borkenau & Ostendorf, 1989; Konstabel, Aavik, & Allik, 2006), they provide an additional perspective on the rated person's disposition that has been suggested to be reliable and valid (e.g., Cohrs, Kämpfe-Hargrave, & Riemann, 2012; Funder, Kolar, & Blackman, 1995; Kandler et al., 2010; Riemann, Angleitner, & Strelau, 1997). The combination of these methods (or multiple methods, in general) allows to control common method variance (Podsakoff et al., 2003) by disentangling true score (i.e., construct-valid) from method variance (Campbell & Fiske, 1959). Hence, this enables an *intersubjectively objective* perspective in the sense that rater specificities are controlled. As Bouchard and Loehlin (2001) put it, "the process of consolidating self- and peer ratings" is "getting rid of specificities of viewpoint" (p. 258).

In the studies of the current dissertation, structural equation models of genetically informed, multi-rater data were run to extent current knowledge on genetic variance in homophobia (study 1). This approach further enabled to examine whether the link between differential parenting and individual differences in right-wing authoritarianism is based on "truly" environmental effects as opposed to confounds, for example due to genotype-environment correlations (study 2). Finally, it allowed to analyze various levels of convergence between value orientations and foci of moral concern (study 3). Studies 1 and 2 used data from the Jena Twin Study of Social Attitudes (JeTSSA; Stößel, Kämpfe, & Riemann, 2006). JeTSSA comprises self-, cotwin, and peer reports from adult twins, and self-reports of twins' partners and parents, which were mainly collected in Germany between 2002 and 2004. Study 3 employed data from the Study of Personality Architecture and Dynamics (SPeADy; www.speady.de). SPeADy is an ongoing research project comprising self-reports from German adolescent and adult twins, twins' parents, offspring and partners, and self- and informant reports from German "non-twin" individuals (including a portion of twin family members). At the time of data analyses, data of the first wave of data collection, conducted between 2016 and 2018, was available.

i. Study 1: Genetic and Environmental Sources of Individual Differences in Homophobia

Intergroup attitudes have been repeatedly associated with dimensions reflecting resistance to change (e.g., right-wing authoritarianism, Cramer, Miller, Amacker, & Burks, 2013; Whitley, 1999), and dimensions reflecting acceptance of inequality (e.g., social dominance orientation; Pratto, Sidanius, Stallworth, & Malle, 1994; Whitley & Ægisdottir, 2000), as well as the general political ideological stance (Lingiardi et al., 2016). Further, intergroup attitudes are often conceptualized as an essential aspect of sociopolitical orientations, as evidenced by the inclusion of items on intergroup attitudes in measures of social and political attitudes (Eysenck's Public Opinion Inventory and different variants of the Wilson–Patterson conservatism scale). These items mostly reflect racial or ethnic attitudes (e.g., white superiority, apartheid), sexist attitudes (e.g., women judges, women's equality or liberation movement), and attitudes towards sexual minorities (e.g., gay rights, gay marriage).

Despite this apparent overlap, the majority of behavior genetic studies focused on core dimensions of sociopolitical orientations (see Table 1). Among the studies focusing on intergroup attitudes, only two examined individual differences in tendencies towards sexual minorities, more specifically attitudes towards homosexuality (Verweij et al., 2008) and the individual approval of gay rights (Eaves & Hatemi, 2008; not included in Table 1). In addition, Eaves, Eysenck, and Martin (1989) reported behavior genetic estimates on all items of the 60-item version of Eysenck's Public Opinion Inventory, including one item reflecting homophobic attitudes ("Homosexuals are hardly better than criminals, and ought to be severely punished"). All reported moderate to substantial genetic (36%–70%) and unique environmental (29–52%) contributions and negligible to small shared environmental contributions (0%–18%).

Study 1 was aimed at extending these findings with a multi-rater design. We investigated sources of individual differences in cognitive, affective, and discriminatory homophobic tendencies toward gay men using twins' self- and informant reports. The inclusion of several rater perspectives allowed us to disentangle variance shared across raters (i.e., rater-consistent or construct-valid variance) from variance unique to each rater perspective (i.e., rater-specific or method variance). This enabled us to estimate net effects from an intersubjectively objective perspective.

Rater-consistent sources of variance in homophobia exceeded estimations of previous studies on homophobia as well as other broad and narrow sociopolitical dimensions based on self-reports (Hatemi & McDermott, 2012; see Figure 1). In accordance with our expectations, we found genetic factors to crucially contribute to individual differences in homophobia (82%), followed by environmental factors not shared between twins reared together (18%). The estimated heritability based solely on self-reports was still substantial, but considerably smaller (52%).

This finding is only partially in line with the higher rater-consistent genetic variance reported by other multi-rater twin studies on personality characteristics. Riemann et al. (1997) reported higher rater-consistent heritability estimates for personality traits, while Kandler et al. (2016) did not find substantial differences in estimated genetic effects between composite scores (aggregates of self- and peer reports), true scores, and self-reports for reported right-wing authoritarianism and social dominance orientation. Considering that the self-rater agreement did not markedly differ between our and the other studies (except for self-other agreements on social dominance orientation in Kandler et al., 2016), these differences indicate that genetic effects found through multi-methods do not merely reflect an increased reliability of the measurement itself. Rather, they provide a more accurate estimation of the sources of the investigated characteristic, namely individual differences in homophobia. This is also supported by the finding that most genetic variation (62%) and a portion of nonshared environmental variation (16%) in self-reported homophobia was also reflected in informant-reported homophobia. Potential explanations for the results include individual differences in phylogenetically developed threat defense mechanisms, as well as differences between twins in contact to homosexuals (Zapko-Willmes & Kandler, 2016a; 2016b).

We found self-report specific factors to be partially heritable (20%). In accordance with past findings (Kandler et al., 2010), this indicates that genetic factors contribute to differences in response tendencies. However, self-rater-specific variance may both reflect self-rater response biases as well as aspects of homophobic attitudes that are inaccessible for acquaintances (Kraemer et al., 2003; Riemann & Kandler, 2010). Since self-reported homophobia was significantly smaller than informant-reported homophobia, however, it most plausibly indicates genetic variance in socially desirable responding. In line with other findings (Kandler et al., 2016), informant report specificity was exclusively explained by unique environmental effects. This may both allude to experiences of the informant and the rated twin that were both not shared with the cotwin as well as not considered for the self-assessment, as well as measurement error.

Some researchers have argued to abandon univariate behavior genetic approaches, as essentially all human traits are heritable and such investigations do not contribute new insights into the "etiology" of various characteristics at best, and may be potentially misleading at worst (e.g., Johnson, Penke, & Spinath, 2011; Turkheimer & Harden, 2014; Turkheimer et al., 2014; for a response to Johnson et al., 2011, see Riemann, Bleidorn, & Kandler, 2011). However, while I would agree that such investigations are just a starting point for understanding genetic and environmental influences on individual differences, the findings of study 1 demonstrate that these investigations do matter.

First, it is necessary to understand why heritability estimates differ depending on the construct of interest. In a review on self-reported political dispositions, Hatemi and McDermott (2012) showed that heritability estimates substantially vary between dimensions (see Figure 1). According to Tesser (1993) and Olson et al. (2001), this may be due to specific features of the attitude itself that are informative for theory construction and development of the respective attitude. In addition, this may assist in the integration of diverse sociopolitical constructs in personality and social psychological theories (Jost et al., 2003, 2009; McAdams & Pals, 2006; McCrae & Costa, 1999; Sibley & Duckitt, 2001, 2017). Second, replications based on the same or a similar approach do not fully advance our understanding. Rather, findings must be replicated and extended across methods, including observational methods (Borkenau, Riemann, Spinath, & Angleitner, 2000), implicit measures (Cunningham, Preacher, & Banaji, 2001), and molecular genetic, neuroscientific and physiological parameters (Jost & Amodio, 2012). Otherwise, we cannot be sure whether what we have found reflects the characteristic of interest, or just the applied methodological approach.

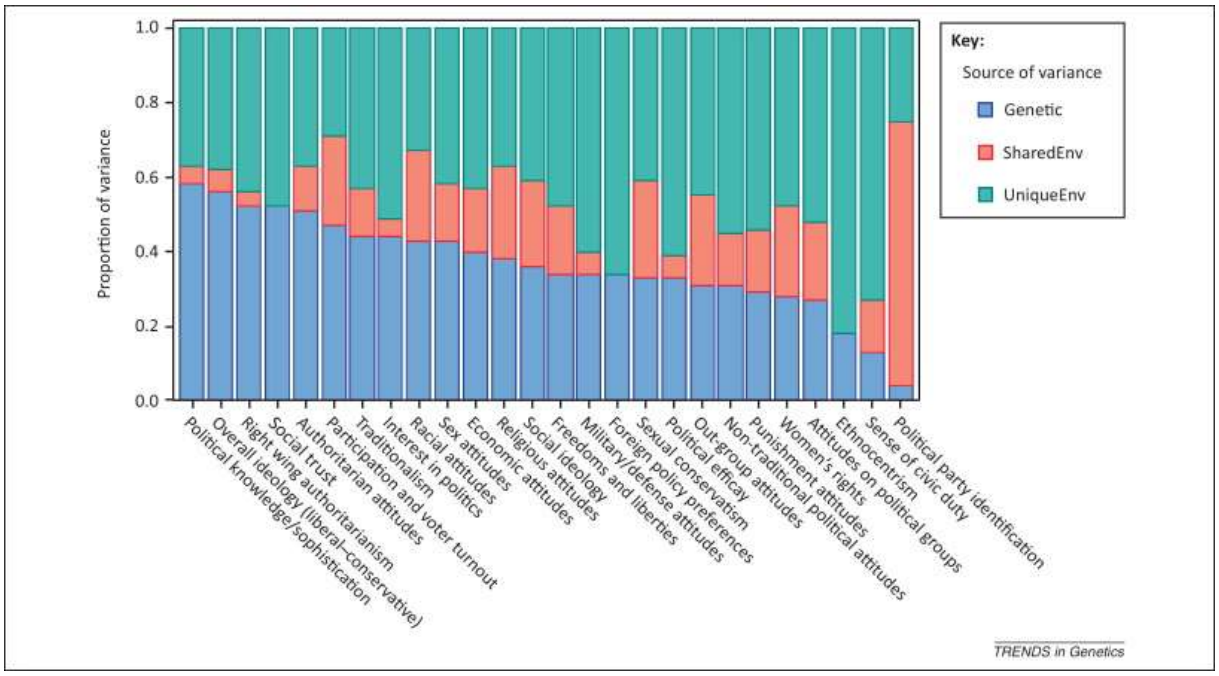

Figure 1. Findings from twin and family studies on the relative contribution of genetic, shared, and nonshared environmental factors to individual differences in broad and narrow dimensions of sociopolitical orientations. Reprinted from Hatemi & McDermott (2012), with permission from Elsevier. Copyright © 2012 Elsevier Ltd.

ii. Study 2: Genetic, Environmental, and Genotype-Environmental Sources of the Covariance between Experienced Parenting and Right-Wing Authoritarianism

A common misunderstanding of behavior genetics is that the focus lies exclusively on genetic factors, when, in fact, one of its central functions is to identify to what extent and how environmental effects may lead to variance in certain human characteristics. However, the interplay between genotype and environments (Plomin et al., 1977; Scarr & McCartney, 1983) hinders causal inferences regarding "truly" environmental influences (Harden, 2014; Kendler & Baker, 2007). This is particularly difficult in the context of sociopolitical orientations, for which family socialization effects have been the primary scientific explanation for decades (e.g., Altemeyer, 1988).

Various behavior genetic designs have been developed to uncover (quasi-)causal links among characteristics as well as between environmental factors and health-related or psychopathological outcomes, and personality characteristics. These include, among others, the co-twin control design (Kendler et al., 1993; Kendler, Karkowski, & Prescott, 1999), direction-of-causation models (Duffy & Martin, 1994; Gillespie, Zhu, Neale, Heath, & Martin, 2003; Heath et al., 1993), and children-of-twins designs (D'Onofrio et al., 2003; for an overview of causality models in quantitative and molecular genetic research; see Briley et al., 2018).

Turkheimer and colleagues (Turkheimer & Harden, 2014; Turkheimer, Pettersson, & Horn, 2014) proposed an approach to infer quasi-causal links between a certain environment and a phenotypic outcome based on within-family differences. They reasoned that – through the control of genetic and shared environmental confounds of the association – a specific environmental factor can be assumed to have a causal effect on the characteristic of interest, if within-twin-pair differences in this environmental factor (i.e., nonshared effects) predict within-twin-pair differences in the characteristic. Hence, these *genetically informed regression models* allow to test whether the association between differences in specific aspects of the family environment and individual differences in sociopolitical orientations are quasi-causally linked in the sense that their association is not confounded due to a passive or evocative genotype-environment correlation.

We deemed this approach to be suitable for the investigation of the link between differential parenting and offspring's RWA in study 2. Parenting, although often conceptualized as a factor shared between siblings, has been argued and reported to be a (partially) nonshared factor between siblings (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Dunn, Stocker, & Plomin, 1990; McGue & Bouchard, 1998; O'Connor, Hetherington, Reiss, & Plomin, 1995; Rowe, 1983), as well as affected by genetic variation (Avinun & Knafo, 2014; Hur & Bouchard, 1995; Klahr & Burt, 2014; Plomin, McClearn, Pedersen, Nesselroade, & Bergeman, 1988; Plomin et al., 1994). The study of right-wing authoritarianism (Altemeyer, 1988, 1996) has been cited as the first attempt at investigating individual differences in sociopolitical orientations (Jost et al., 2003). This core dimension of sociopolitical orientations reflects the individual tendency to adhere to societally established authorities, follow social norms and conventions upheld by these authorities and display aggressive responses against groups that violate the upheld social norms.

To allow for more nuanced interpretations, we complemented genetically informed regression models on self-reported retrospective parenting and self- and informant-reported RWA with *phenotypic semilatent multitrait-multimethod models*. These models considered offspring's (i.e., twins'), mothers' and fathers' retrospective reports on experienced parenting and self- and informant reports on offspring's RWA. The inclusion of these phenotypic models enabled us to further test whether (1) passive and/or (2) evocative genotype-environment correlation, (3) global and/or (d) response biases due to the offspring's RWA may bias the association. In line with the body of research, we analyzed the impact of two parenting dimensions, namely parental responsiveness (i.e., provided emotional warmth and support) and parental demandingness (i.e., parental control and monitoring).

We found the unexpected positive association between parental responsiveness and offspring's RWA to probably underlie an evocative genotype-environment correlation. In other words, the offspring's genetically influenced disposition and related behaviors (e.g. obedience, conformity) were associated with his or her experienced parental responsiveness. This association was independent of the parents' RWA. In contrast, we found the parental RWA to partially mediate the (unexpected) effectively environmental association between offspring's

differentially experienced demandingness and differences in their RWA scores. In other words, although we found an association between parental and offspring's RWA, which is probably attributable to their genetic relatedness, the association between parental demandingness and offspring's RWA was not due to a genetic confounding. Given past reports on the genetic factors of both parenting and RWA, we probably would not have expected this result, which highlights the importance of including information on the parental characteristic. Different implications of maternal and paternal RWA further suggest to ideally consider both parents in such analyses.

In addition, although the found effects due to response biases were small, we found a negative association between offspring's report on experienced demandingness and their rater-consistent RWA score. This suggests that the demandingness–RWA link might have been underestimated if we had not included multiple rater perspectives.

In sum, we achieved insightful results via available genetic and multi-rater information on the environmental variable as well as the characteristic of interest. While the results do not allow for causal inference, they deepen the understanding of the association between differential parenting and sibling's differences in sociopolitical orientations. Furthermore, they show the importance of including such information when investigating factors of the family environment (Harden, 2014; McGue & Bouchard, 1998).

iii. Study 3: Convergence of Structure, Sources, Age Trends, and Links of Value Orientations and Foci of Moral Concern

The course of time and its consequences for the use-by date of political issues may make it necessary and even unavoidable to study more abstract dimensions of sociopolitical orientations. Two frameworks appear to be particularly useful in this context: basic values as described by the refined theory of basic human values (Schwartz, 1992, 1994; Schwartz & Bilsky, 1987; Schwartz et al., 2012) and moral concerns as defined in the moral foundation theory (Graham, Haidt, & Nosek, 2009; Graham et al., 2011; Haidt & Joseph, 2004, 2007).

Whereas the association between basic values and core dimensions of sociopolitical orientations has been – although to varying degrees – discussed (see **Section I**), the link between moral concerns and sociopolitical orientations is rather diffuse. Different researchers have suggested that foci of moral concern affect political dispositions (e.g., Lewis & Bates, 2011; van Leeuwen & Park, 2009), are affected by them (e.g., Federico, Weber, Ergun, & Hunt, 2013; Kugler, Jost, & Noorbaloochi, 2014), or merely reflect states of post hoc justifications of ideological attitudes (e.g., Emler, Renwick, & Malone, 1983).

In view of the scarce research on the dimensions' link (Feldman, 2018; Graham et al., 2011; Sverdlik, Roccas, & Sagiv, 2012) and the need for conceptually more parsimonious research (Funk et al., 2013), study 3 was aimed at examining the convergence between value and moral focus dimensions. We considered the conceptual similarities of the described dimensions – despite their unclear links with core sociopolitical orientations – to be indicative of

their convergence. Moreover, we theorized that they represent manifestations of fundamental world beliefs, as defined in the dual-process motivational model of ideological attitudes (Duckitt & Sibley, 2017). We expected a value orientation towards conservation versus openness to change to converge with a moral focus on organization versus opportunity (i.e., a moral focus on authority-, loyalty-, and sanctity-related transgressions), and a value orientation towards self-transcendence versus self-enhancement to converge with a moral focus on social versus individual outcomes (i.e., a moral focus on care- and fairness-related transgressions). Applying separate multi-rater and behavior genetic analyses, we defined four criteria of convergence: (1) structural convergence, tested through multitrait-multirater models, (2) communality in age-related trends across sexes, tested through regression models, (3) source-related convergence, tested through bivariate twin models, and (4) common covariance with key personality traits (openness to experience or honesty-humility), tested through zero-order and semipartial correlation analyses. While we did not have multi-rater twin data, we computed latent factor scores in order to disentangle common method variance from trait variance. This resulted in more precise results by controlling for response tendencies.

We found the paired dimensions to be systematically associated but distinct characteristics. The comparably higher heritability estimate and correlation with the key personality trait of each value orientation indicate that value dimensions belong to a different personality layer than foci of moral concern (McAdams & Pals, 2006).

Conservation versus openness to change and a moral focus on organization versus opportunity showed a stronger overall association. These dimensions were structurally and partially source-related convergent (i.e., they showed moderate genetic and environmental covariance), but varied in age-related and sex effects. Furthermore, conservation vs. openness to change mediated the link between openness to experience and a moral focus on organization versus opportunity. The results suggested that motives as described by Jost et al. (2003; 2009) as well as critical threat-inducing events may play a crucial role for individual differences in moral concerns for authority, loyalty, and sanctity.

Self-transcendence versus self-enhancement partially converged on a structural level and shared solely environmental sources of variance but had different age trends. In addition, self-transcendence versus self-enhancement showed a substantial link with honesty-humility and mediated its association with a moral focus on social versus individual outcomes. We discussed that this finding may be due to measurement error or potentially environmental factors affecting both.

In conclusion, the application of behavior genetic and multi-rater data as criteria of convergence between dimensions offered several insights and a differentiated view on the link between value orientations and foci of moral concern. It not only enables to understand the link between specific sociopolitical dimensions, but it can further give clarify their position in broadly defined and multilayered personality frameworks (Kandler et al., 2014; McAdams & Pals, 2006).

IV. Conclusions

The applied and related methods are merely approximations of reality and should be understood as such. Still, whether for univariate (study 1) or bivariate designs including the association between an environment and a characteristic (study 2) or between two characteristics (study 3), the integrative approaches employed in this work will hopefully contribute to the understanding of sources of interindividual differences in sociopolitical attitudes, prejudices, values, and moral concerns.

For such methodological approaches to be advantageous in the long term, however, it needs a theoretical (obviously falsifiable) framework that identifies and explains sources of variation and hierarchical levels in broad and narrow sociopolitical orientations. Such an investigation is in dire need of non-Western samples. As of now, almost all behavior genetic studies on sociopolitical orientations relied on US, Australian, and British twin data (Hatemi et al., 2014), despite found cultural differences (Aspelund, Lindeman, & Verkasalo, 2013). To achieve a universally valid framework, cross-cultural studies are indispensable.

Evidently, the scientific inquiry of genetic and environmental sources of variation in sociopolitical orientation still has – so to speak – a long road ahead. The present work was aimed at easing the way.

V. List of Manuscripts

Study 1: Zapko-Willmes, A., & Kandler, C. (2018). Genetic Variance in Homophobia: Evidence from Self-and Peer Reports. *Behavior genetics*, *48*(1), 34–43. doi:10.1007/s10519-017-9884-9

Study 2: Zapko-Willmes, A., Riemann, R., & Kandler, C. (2018). Unravelling Quasi-Causal Environmental Effects via Phenotypic and Genetically Informed Multi-Rater Models: The Case of Differential Parenting and Authoritarianism. *European Journal of Personality, 32*(3), 233–253. doi:10.1002/per.2144

Study 3: Zapko-Willmes, A., Schwartz, S., Richter, J., & Kandler, C. (submitted for publication in *Journal of Personality and Social Psychology*). A Multi-Rater and Twin Study on the Convergence of Basic Value Orientations and Foci of Moral Concern.

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Appendix: Manuscript and Supplement of Study 3

A Multi-Rater and Twin Study on the Convergence of Basic Value Orientations and Foci of Moral Concern

Alexandra Zapko-Willmes[1,2], Shalom H. Schwartz[3], Julia Richter[1,2], and Christian Kandler[1,4]

[1]MSB Medical School Berlin, [2]Bielefeld University, [3]The Hebrew University of Jerusalem, [4]University of Bremen

Author Note.

Alexandra Zapko-Willmes, Department of Psychology, MSB Medical School Berlin, Berlin, Germany & Department of Psychology, Bielefeld University, Bielefeld, Germany;

Shalom H. Schwartz, Department of Psychology, The Hebrew University of Jerusalem, Jerusalem, Israel.

Julia Richter, Department of Psychology, Bielefeld University, Bielefeld, Germany & Department of Psychology, MSB Medical School Berlin, Berlin, Germany.

Christian Kandler, Department of Psychology, MSB Medical School Berlin, Berlin, Germany & Department of Psychology, University of Bremen, Bremen, Germany.

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Correspondence concerning this article should be addressed to Alexandra Zapko-Willmes, MSB Medical School Berlin, Calandrellistr. 1–9, 12247, Berlin, Germany.

Phone: +49 15774695812

Email: alexandra.zapko@uni-bielefeld.de

Abstract

This study examined the links between basic value orientations and foci of moral concerns, theorized to reflect fundamental world beliefs. We hypothesized that prioritizing conservation versus openness to change values (V/Con) converges with a moral focus on organization versus opportunity (M/Org) and prioritizing self-transcendence versus self-enhancement (V/Sel) converges with a moral focus on social versus individual outcomes (M/Soc). We analyzed self-ratings from 1,421 individuals and 555 twin pairs as well as 924 complementary self- and informant ratings. Individual factor scores were calculated using the partial least squares regression method based on hierarchical confirmatory factor analyses. We examined (1) the structural convergence of values and moral concerns, (2) their commonality in age-related trends across sexes, (3) common genetic and environmental sources of variance, and (4) their associations with conceptually related personality traits openness to experience and honesty-humility. V/Con and M/Org converged across different methods and shared a moderate proportion of genetic and environmental variance, with their latent common factor mediating the entire genetic variance in M/Org. However, age and sex differences were not convergent, and V/Con mediated the association between openness to experience and M/Org. V/Sel and M/Soc showed a partial structural (i.e., a latent common factor) and source-related (i.e., environmental) convergence, but diverging age trends and distinct genetic sources of variance. V/Sel was substantially linked with honesty-humility and mediated the link between honesty-humility and M/Soc. The results indicated that value orientations and foci on moral concern are closely linked but distinct constructs. Findings are discussed regarding conceptual and measurement-related implications.

Keywords: basic values; morality; world beliefs; multi-rater study; twin study; personality traits

A Multi-Rater and Twin Study on the Convergence of Basic Value Orientations and Foci of Moral Concern

Basic values and moral concerns are similar in function, structure, and content. Following established theoretical frameworks, they represent necessary responses to the same (social) environmental requirements of human survival and form two-dimensional structures that resemble each other in content (Haidt & Joseph, 2004, 2007; Schwartz, 1992, 1994; Schwartz et al., 2012). It is therefore unsurprising that the two constructs show systematic links (e.g., Graham et al., 2011).

A number of studies linked basic values to constructs associated with moral concerns, such as ethical decision-making, attitudes towards (business) ethics, and unethical behavior (Feldman, Chao, Farh, & Bardi, 2015; Mamsori, Rezaee, Homayoun, & Noghondari, 2015). Yet, there is little research on the nature of the association between basic values and moral concerns (Feldman, 2018; Sverdlik, Roccas, & Sagiv, 2012). Clarifying their divergence would shed light on the validity of their construct specificities: The distinction between how people prioritize certain values and how they discern “right” from “wrong”. Moreover, if these frameworks express the same fundamental dimensions, research on the link between them and strongly associated complex traits and behaviors, such as personality traits (Lee, Ashton, Ogunfowora, Bourdage, & Shin, 2010), ideological attitudes (e.g., Sinn, in press), and voting (Schwartz, Caprara, & Vecchione, 2010), would benefit from a narrow, consistent, and psychometrically sound approach to the measurement of these underlying dimensions.

In the present study, we investigated the construct convergence and specificity of basic value orientations and foci of moral concern via self-rater, multi-rater, and twin family data. We specified four criteria to examine their convergence: (a) a common structural basis within and across self- and informant reports, (b) similar age trends across sexes, (c) common factors mediating shared genetic and environmental sources of interindividual variance, and (d)

strong links between these common factors and conceptually related personality trait dimensions. We propose that the common factors of core value and moral focus dimensions may reflect fundamental world beliefs, as described in the dual-process motivation model of ideological attitudes (Duckitt, 2001; Duckitt & Sibley, 2017).

On Basic Values and Moral Concerns

Basic Value Orientations. Schwartz and Bilsky (1987, 1990) proposed a theory of basic human values (see also Schwartz, 1992) that has been validated in more than 75 countries (Schwartz, 2015). Adopting value characteristics that previous research had agreed upon, they defined values as trans-situational beliefs about the importance of desirable goals that drive behaviors and serve as standards for evaluating entities (i.e., events, actions, organizations, and people). Individuals prioritize their values by assigning varying degrees of importance to them. Schwartz and Bilsky derived a set of 10 basic values by theorizing that values represent the motivational contents necessary to fulfill individual biological needs, regulate social interactions, and preserve group well-being and survival. Schwartz et al. (2012) refined the theory to distinguish 19 values by partitioning seven values into more narrowly defined value subtypes and adding two more (for a validation of the refined theory across 31 countries, see Schwartz, 2017).

Values form a circular motivational continuum (see Figure 1A), in which adjacent values are compatible and opposing values incompatible. Based on this, two sets of opposing higher-order values can be derived that form the poles of two (almost orthogonal) dimensions (Schwartz, 1992, 2017). These value dimensions are conservation versus openness to change (V/Con) and self-transcendence versus self-enhancement (V/Sel). V/Con refers to the conflict between *conservation* and *openness to change*. Conservation values express preferences for (a) individual and societal safety (*security–personal* and *–societal*), (b) maintaining family, cultural and religious conceptions and customs (*tradition*), and (c) avoiding upsetting others

(*conformity–interpersonal*) and complying with formal rules, norms, and obligations (*conformity–rules*). Openness to change values are opposed to these goals. They express preferences for (a) new, exciting, and diverse experiences (*stimulation*) and (b) independence of thought and action (*self-direction–thought* and *–action*). V/Sel contrasts *self-transcendence* and *self-enhancement*. Self-transcendence values comprise priority of (a) care for the well-being of one's in-group (*benevolence–caring* and *–dependability*) and (b) equality and social justice for all people, tolerance for out-groups, and preservation of nature (*universalism–concern*, *–tolerance*, and *–nature*). By contrast, self-enhancement values reflect preferences for (a) personal power through wealth and authority (*power–resources* and *–dominance*) and (b) ambition, success, and admiration for one's accomplishments (*achievement*). In addition, being modest and humble (*humility*) express the self-transcendence pole of V/Sel, whereas protecting one's reputation and avoiding humiliation (*face*) express the self-enhancement pole of V/Sel. Moreover, both humility and face partially express conservation motivations. Striving for pleasure and enjoyment (*hedonism*) mainly represents an openness to change value, but may also express self-enhancement.

Foci of Moral Concern. Based on evolutionary and anthropological considerations, Haidt and Joseph (2004, 2007) developed and extended the moral foundations theory as a theory of transculturally valid virtues or modules of moral intuition (Graham, Meindl, Beall, Johnson, & Zhang, 2016). These related modules (termed foundations) constitute an innate mental structure of moral judgment that has evolved due to its advantages for the individual and for inclusive fitness. The modules promote (intuitive) protection of the kin, coordinate profitable cooperation and handling of cheating, strengthen the group's control over resources, facilitate navigation through complex hierarchical structures, and protect against parasites and (communicable) diseases. More elaborate moral reasoning that supports and

rationalizes the initial, intuitive reactions may ensue following these instantaneous, often affective responses (Graham et al., 2011; Haidt & Kesebir, 2010).

The five moral foundations that has been defined form two dimensions, or foci, based on their "locus of moral value" (Graham, Haidt, & Nosek, 2009, p. 1030). These two foci reflect different regulatory systems for selfish behaviors: a moral focus on organization versus opportunity (M/Org) and a moral focus on social outcomes versus individual outcomes (M/Soc; see Figure 1B). M/Org expresses a concern for transgressions on a group level through (a) adherence to hierarchical structures, tradition, and concern for social order (*authority vs. subversion*), (b) concern for obligations regarding one's group affiliation (*loyalty vs. betrayal*), and (c) concern for spiritual purity and body integrity (*sanctity vs. degradation*). M/Soc emphasizes protecting individuals through concern for (a) the well-being of others (*care vs. harm*) and (b) justice, proportionality, and autonomy (*fairness vs. cheating*).

Correlation or Convergence?

Despite different theoretical and methodological approaches, basic values and moral concerns overlap in function, structure, and content. They serve as necessary responses to three human existential demands posed by the environment. They satisfy biological needs, coordinate and structure social interactions, and ensure group functioning and survival (Haidt & Joseph, 2004, 2007; Schwartz, 1992, 1994). Their dimensional structures coincide in content: V/Con and M/Org focus on giving priority to security and stability (preserving the status quo) versus risk and change (individual and environmental exploration); V/Sel and M/Soc focus on giving priority to social issues (care of others and cooperation) versus individual advancement (gaining and maintaining power, prestige, and status). Past studies confirmed these parallels, but differed in their conclusions about the convergence (Feldman, 2018; Graham et al., 2011; Sverdlik et al., 2012). Feldman (2018) investigated the links

between basic value orientations and foci of moral concern in large multi-national samples of different self-report measures. Based on results of confirmatory factor analyses, correlational patterns, and incremental predictive validity of both frameworks for morality-related outcomes, he concluded that basic value orientations and foci of moral concern are related yet unique traits. Applying specific values as external criteria for their moral foundations questionnaire, Graham et al. (2011) similarly argued that the dimensions are distinct due to their incremental predictive validity. Moreover, while these authors could not test for a causal association, they speculated that both frameworks probably develop in parallel and represent the same personality layer within a broad personality conception (McAdams & Pals, 2006).

McAdams and Pals (2006) proposed five principles for comprehensive personality research. They differentiated three levels of personality: dispositional traits, characteristic adaptations, and integrative life narratives. Both basic value orientations and foci of moral concern have been categorized as characteristic adaptations (Cieciuch & Schwartz, 2017; Haidt, Graham, & Joseph, 2009; McAdams & Pals, 2006) that are more environmentally malleable (i.e., less genetically "anchored") and less stable over time than dispositional traits. However, literature on the dimensions suggests that, while foci of moral concern may reflect characteristic adaptations, basic value orientations show features of dispositional traits. Individual differences in value priorities are relatively stable (e.g., Bardi, Lee, Hofmann-Towfigh, & Soutar, 2009; Milfont, Milojev, & Sibley, 2016; Schwartz, 2005; Vecchione et al., 2016) and partly heritable (Kandler, Gottschling, & Spinath, 2016; Keller, Bouchard, Arvey, Segal, & Dawis, 1992; Knafo & Spinath, 2011; Renner et al., 2012; Schermer, Vernon, Maio, & Jang, 2011; for an exception, see Schermer, Feather, Zhu, & Martin, 2008). Findings on the differential stability of moral concerns are inconsistent (Graham et al., 2011; Smith, Alford, Hibbing, Martin, & Hatemi, 2017), and individual differences in moral concerns appear to be primarily attributable to environmental factors (Smith et al., 2017). By

definition, dispositional (or core) traits should have a stronger impact on (associated) characteristic adaptations than vice versa, and genetic factors contributing to the variance in dispositional traits should explain the genetic variance in characteristic adaptations (or surface traits; Kandler, Zimmermann, & McAdams, 2014). Hence, individual differences in basic value orientations (as potential dispositional traits) may predict individual differences in foci of moral concern (as potential characteristic adaptations).

Sverdlik et al. (2012) argued that the values framework fully depicts the spectrum of intra- and cross-cultural moral principles. They pointed out that values with a social focus, namely conservation and self-transcendence values, reflect the moral codes described by the most prominent models on morality, including the moral foundations theory. Furthermore, values with a personal focus, namely openness to change and self-enhancement values, reflect a violation of these moral codes. Therefore, basic value orientations and foci of moral concern may underlie the same preferences for a social versus personal approach to certain goals and moral principles. We argue that basic value orientations and foci of moral concern may reflect convergent dimensions in terms of two fundamental world beliefs. We base this assertion on their common phylogenetic function, their evaluative nature, and their reported links with "key" constructs (see below).

Manifestations of Dangerous and Competitive World Beliefs

Both frameworks have been repeatedly linked to right-wing authoritarianism and social dominance orientation (e.g., Cohrs, Moschner, Maes, & Kielmann, 2005; Duriez & Van Hiel, 2002; Duriez, Van Hiel, & Kossowska, 2005; Graham et al., 2011; Heaven, Organ, Supavadeeprasit, & Leeson, 2006; Kugler, Jost, & Noorbaloochi, 2014). V/Con and M/Org showed positive associations with right-wing authoritarianism, the individual tendency to submit to legitimate authorities, conform to the norms and social conventions upheld by them, and exhibit aggressiveness against nonconforming people (Altemeyer, 1988). V/Sel and

M/Soc showed negative associations with social dominance orientation, the individual preference for hierarchical over egalitarian social structures (Pratto, Sidanius, Stallworth, & Malle, 1994).

The dual-process motivational (DPM) model of ideology and prejudice holds that social world beliefs and personality trait dispositions jointly shape individual differences in these sociopolitical attitudes (Duckitt, 2001; Duckitt & Sibley, 2017; Leone, Desimoni, & Chirumbolo, 2012). More specifically, the belief about the world as a dangerous, unpredictable, and threatening place (*dangerous world belief*) and low openness to experience predict right-wing authoritarianism, and the belief about the world as a competitive and ruthless "jungle" (*competitive world belief*) and low honesty-humility predict social dominance orientation (e.g., Sibley, Harding, Perry, Asbrock, & Duckitt, 2010).

Rohan (2000) proposed that basic value orientations reflect these social world beliefs: Conservation expresses a high level and openness to change a low level of dangerous world belief. Self-transcendence expresses a low level and self-enhancement a high level of competitive world belief. Federico, Weber, Ergun, and Hunt (2013) associated moral concerns with these world beliefs in the context of the DPM model. They suggested that a moral focus on organization (vs. opportunity) is positively associated with a dangerous world belief, and that a moral focus on social (vs. individual) outcomes is negatively associated with a competitive world belief. Particular personality trait dimensions showed systematic associations with both basic values (e.g., Anglim, Knowles, Dunlop, & Marty, 2017; Lee et al., 2009, 2010; Pozzebon & Ashton, 2009) and moral concerns (Zeigler-Hill, Noser, Roof, Vonk, & Marcus, 2015) in line with the DPM model: Openness to experience correlated

negatively with V/Con and M/Org, and honesty-humility correlated positively with V/Sel and M/Soc.[1]

In sum, a dangerous world belief may drive the preference for security, structure, and stability (vs. progress and change) which is expressed in V/Con and M/Org, and a competitive world belief may drive the preference for individual profit and success (vs. social harmony and support), which is expressed in V/Sel and M/Soc. To evaluate this theorized convergence, we specified four criteria of convergence.

Convergence Criteria

Structural Convergence. Convergent constructs should highly covary due to a common construct-valid factor. Previous studies often relied on the single method of self-reports. This can lead to under- or overestimation of the strength of a link due to common method variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Multitrait-multimethod analyses (Campbell & Fiske, 1959) can uncover the proportion of covariance attributable to method effects and the proportion of shared variance between constructs across methods (i.e., convergent validity). Combining different rater perspectives, such as self- and informant reports, allows partialing out rater-specific response tendencies (Eid, Lischetzke, Nussbeck, & Trierweiler, 2003).

Age-Related Commonality. Convergent constructs should show similar age trends across sexes as an expression of age-related influences (e.g., maturation and/or cohort-specific context effects) on a common factor. In contrast, divergent age trends would suggest that the dimensions represent distinct constructs. Sex should be considered as additional sociodemographic variable, since age-related influences may differ between sexes (e.g., due

[1] For associations between Big Five personality trait dimensions and values, see Fischer and Boer (2015), Parks-Leduc, Feldman, and Bardi (2015), and Vecchione, Alessandri, Roccas, and Caprara (in press); For the link with moral concerns, see Hirsh, DeYoung, Xu, and Peterson (2010) and Lewis and Bates (2011).

to specific social roles). Moreover, similar age trends with different effect sizes may allow two conclusions: The dimensions might either (a) reflect unique dispositions that differ in their age-related malleability, or (b) reflect expressions or operationalizations of a common factor that differ in their age-related malleability. Whereas the latter would indicate measurement artifacts, the former suggests that value and moral focus dimensions could belong to different personality layers (McAdams, 2013). However, this must be interpreted with caution in cross-sectional data.

Past research suggests that age and sex differences should be comparable for the respective dimensions (e.g., Feather, 1984; Graham et al., 2009; Hinz, Albani, Gießler, & Brähler, 2002; Milfont et al., 2016; Robinson, 2013; Sağel, 2015; Schwartz & Rubel, 2005). In a longitudinal study of people between the ages 25 and 75, Milfont et al. (2016) found that the prioritization of openness to change and self-enhancement values decreased with age, whereas the prioritization of conservation and self-transcendence values increased. They found men and women to differ, with men prioritizing openness to change and self-enhancement more than women, and women prioritizing conservation and self-transcendence more than men. In addition, they found a significant age × sex interaction effect, with the prioritization of openness to change values decreasing more steeply with age in women. Sağel (2015) reported similar findings for moral concerns in an age-heterogeneous cross-sectional study. She found participants between ages 19 and 39 and male participants to be more focused on opportunity and individual outcomes and participants between ages 40 and 87 and female participants to be more focused on organization and social outcomes. In addition, she also reported an age × sex interaction for M/Org concerns comparable to the interaction effect for V/Con reported by Milfont et al. (2016): Younger men focused more on M/Org concerns than younger women, but older women focused more on M/Org concerns than men.

Common Sources of Variance. Individual differences in convergent constructs should be attributable to genetic and environmental sources to a similar degree. A common factor mediating the common genetic and environmental components of the individual differences should largely explain them. Twin data can help to identify common and unique sources of individual differences in the focused characteristics. Such data permit comparing the amount of common and specific sources of variance. In addition, univariate estimates of genetic and environmental contributions to the variance in value and moral concern dimensions can provide further evidence for classifying the constructs into personality layers: Substantial differences in the degree of environmental sensitivity would indicate that they reflect different layers of personality characteristics (Kandler et al., 2014; McAdams & Pals, 2006).

Links with Personality Traits. We hypothesized that the common factors underlying V/Con and M/Org as well as V/Sel and M/Soc reflect fundamental world beliefs. Those common factors should therefore be substantially linked with the personality trait dimensions openness to experience and honesty-humility, respectively, as proposed by the DPM model. More specifically, the common factor should at least mediate the association between the respective personality trait dimension and the value orientation or moral focus.

The Present Study

We sought to investigate the construct convergence of value orientations, based on Schwartz' refined theory of basic human values, and foci of moral concern, based on the moral foundations theory. We expected convergence of the orientation towards conservation versus openness to change (V/Con) with a moral focus on organization versus opportunity (M/Org; Hypothesis 1; H1). We further expected convergence of the orientation towards self-transcendence versus self-enhancement (V/Sel) with a moral focus on social versus individual outcomes (M/Soc; Hypothesis 2; H2).

To test for these convergences, we applied the four criteria specified above and formulated secondary hypotheses: Convergent dimensions (V/Con with M/Org and V/Sel with M/Soc) should show (1) high associations within and across different methods rather than construct-specific components across different methods (H1a and H2a), (2) comparable age trends across sexes (H1b and H2b), (3) common genetic and environmental variance mediated by a common factor rather than specific genetic and environmental sources (H1c and H2c), and (4) a common factor partially accounting for (or mediating) their association with openness to experience (H1d) or honesty-humility (H2d). We assessed the extent to which these criteria (hypotheses) were met using three age-heterogeneous subsamples (a self-rater, a multi-rater, and a twin subsample). We conducted extended multitrait-multirater analyses (criterion 1; hypotheses H1a and H2a), multiple regression analyses (criterion 2, hypotheses H1b and H2b), bivariate twin model analyses (criterion 3, hypotheses H1c and H2c), and both correlation and semipartial correlation analyses (criterion 4, hypotheses H1d and H2d).

Methods

Samples

We used data from the Study of Personality Architecture and Dynamics (SPeADy). SPeADy is an ongoing longitudinal research project currently comprising cross-sectional data from the first wave of assessment provided by two German-speaking samples. The samples were primarily recruited in Germany between January 2016 and January 2018. One sample consists of twins and twins' participated parents, offspring, and life partners (*twin-family study*). The other sample consists of self-raters and informants (*age-groups study*). Respondents were invited to participate either via an online platform or through mailed questionnaires and completed a variety of measures on personality traits and related

motivational and attitudinal characteristics. For details on the SPeADy project, see the project's website: www.speady.de.[2]

For the analyses, we sorted participants into three subsamples: a self-rater subsample, a twin subsample, and a multi-rater subsample. All subsamples were age-heterogeneous and contained a slightly higher proportion of female participants (see Table 1). The self-rater subsample included respondents who provided self-reports on all measures: 657 participants in the age-groups study, 670 mostly independent relatives and partners of twins, and 94 twins (those without available or sufficient co-twin data). The twin (self-rater) subsample included 555 twin pairs[3]: 218 monozygotic (MZ) twin pairs (168 female and 50 male) and 337 dizygotic (DZ) twin pairs (191 female, 56 male, and 90 opposite-sex pairs). Finally, the multi-rater subsample included respondents who provided a self-report (henceforth the *targets*) and at least one informant report. Due to our methodological approach (see below) and the relatively small number of multiple informant ratings of the same target, we considered only one informant report per target. For informants rated by more than one informant, we included reports of those informants who completed all measures and reported to know the target best and at least fairly well. Most informants indicated to know the target very well (71%) or well (26%), with 3% indicating to know them fairly well. On average, informants knew the targets for 19.13 years (SD = 14.21).

Measures and Measurement Models

Basic value orientations. Participants completed the German version of Schwartz's Refined Portrait Values Questionnaire (Schwartz et al., 2012). They were instructed to rate the items in accordance with their, respectively the target person's, similarity to the portrayed

[2] The SPeADy data is available as scientific use file on request. Requests should be send to Prof. Dr. Christian Kandler. See www.speady.de for more details on the request procedure and policies on data privacy protection.

[3] Among these was one set of multizygotic triplets, which we treated as 3 dyadic DZ twin pairs.

person, with each of the 57 items describing a person in terms of his/her values. Items were rated on a 6-point scale, ranging from 1 (*not like me/the target person at all*) to 6 (*very much like me/the target person*). Tables A1 to A2 in supplement A provide descriptive statistics. In order to confirm the measurement model, we ran hierarchical confirmatory factor analysis (CFA) models with two uncorrelated higher-order value dimensions V/Con and V/Sel. We specified that 16 value items load on one or the other dimension and allowed three values (face, hedonism, humility) to load on both. In addition, all 57 value items loaded on a common factor, which can be seen as a rater-specific method factor in terms of, for example, acquiescence (see Figure 2A for the model). In order to achieve model identification, we fixed factor means to zero and the loading of one item (the one with the highest loading after a first iteration) on each latent factor to one.

We ran separate CFAs for each subsample. For the two subsamples comprising dependent groups of raters (i.e., targets and well-informed acquaintances or twin siblings *twin 1* and *twin 2*), we tested for metric measurement invariance[4] by performing a single group analysis in which ratings were clustered within dyads. In other words, we did not compare raters via separate groups, but nested them within dyads. We compared a model with factor loadings constrained to be equal across raters (and twin siblings) to an unconstrained model. The models allowed complementary higher-order factors (i.e., V/Con based on self- and informant report) to be correlated. In addition, we ran a multi-group analysis with self-ratings

[4] A "complete" test for metric measurement invariance is empirically (at present) not possible, since metric measurement invariance cannot be distinguished from a "univariate pattern of non-invariance" (e.g., Klößner & Klopp, 2017; Raykov, Marcoulides, & Li, 2012). In other words, the test only allows us to check whether the ratios between fixed loadings are invariant, not whether factor loadings uniformly differ in strength between groups. However, given the characteristics of the dependent and independent groups we compared (i.e., participants of the same cultural background, comparable in age ranges, most likely comparable in cognitive abilities), we deem such uniform loading differences between the tested groups unlikely and assume that our approach is reliable in this regard.

from the single-rater and multi-rater subsample and self-reports from the twin subsample with only one randomly assigned twin of a pair. Models were tested in R 3.4.0 (R Core Team, 2017) using RStudio 1.0.143 (RStudio Team, 2016) and the packages lavaan (Rosseel, 2012), semTools (semTools Contributors, 2016), and psych (Revelle, 2017). Parameters were estimated via maximum likelihood estimation with robust standard errors (Huber–White "sandwich" estimator) and a scaling-corrected χ^2 test statistic (asymptotically) analogous to the Yuan-Bentler T_2* test statistic (MLR; Yuan & Bentler, 2000). For model evaluation, we considered model fit requirements for optimal Type I and Type II error rejection rates (combinational rule of root mean square error of approximation [RMSEA] < .06 and standardized root mean square residual [SRMR] < .09; Hu & Bentler, 1999; Steiger, 1990).[5]

Since the χ^2-difference test statistic might lead to a false model rejection, we additionally considered alternative fit guidelines in the form of changes in CFI (ΔCFI $\leq$ .01) for testing metric measurement invariance (Cheung & Rensvold, 2002; Little, 2013). The hierarchical CFA models for the subsamples, with fixed parameters across dependent groups for the twin and multi-rater subsample, showed a satisfactory fit (RMSEA = .040–.048, SRMR = .060–.070). The Satorra-Bentler scaled χ^2-difference test (Bryant & Satorra, 2012; Satorra & Bentler, 2001) indicated that the constrained model did not yield a significantly worse fit than the unconstrained model for the self-rater ($\Delta\chi^2_{SB}$ = 242.87, Δdf = 228, p = .238) and twin ($\Delta\chi^2_{SB}$ = 106.28, Δdf = 114, p = .684) subsample. This was not the case for the multi-rater subsample ($\Delta\chi^2_{SB}$ = 94.70, Δdf = 58, p = .002). However, the alternative fit index (ΔCFI = .00) indicated metric measurement invariance for this subsample as well. Tables B1 to B2

[5] Following a rule of thumb proposed by Kenny, we do not report incremental fit indices for the CFA models because the RMSEA of all baseline models of basic value orientations and of two baseline models of foci of moral concern was < .158 (see http://davidakenny.net/cm/fit.htm).

of supplement B provide model fit statistics (including χ^2-test statistics) and parameter estimates.

Foci of Moral Concern. The individual endorsement of moral concerns (Haidt et al., 2009) was measured via a German short version of the Moral Foundations Questionnaire (retrieved from www.moralfoundations.org/questionnaires; Graham et al., 2011). The questionnaire consisted of two subscales of 10 items: The *relevance* subscale measured the (target's) ascribed relevance of various moral concerns when evaluating (im)morality. The *judgment* subscale measured the target's level of agreement with contextualized statements pertaining to moral concerns. Items were rated on a 6-point scale, ranging from 1 (*not at all relevant*/*strongly disagree*) to 6 (*extremely relevant*/*strongly agree*).

We replaced two loyalty (vs. betrayal) items and one authority (vs. subversion) item with items from the full questionnaire version[6], because a preliminary data analysis in a German sample (Joeckel, Bowman, & Dogruel, 2012) yielded small correlations between the replaced items and the other items of the same foundation.[7] Moreover, one loyalty item contained a for German participants particularly socially undesirable statement given historical connotations.[8] For item wording, see the above URL. Tables A3 and A4 of supplement A provide descriptive statistics.

Similar to the procedure for value orientations outlined above, we ran hierarchical CFAs, with two uncorrelated higher-order factors, moral focus on social outcomes versus

[6] "Whether or not someone's action showed love for his or her country" was replaced by "Whether or not someone showed a lack of loyalty", and "Men and women each have different roles to play in society" was replaced by "If I were a soldier and disagreed with my commanding officer's orders, I would obey anyway because that is my duty".

[7] We would like to thank Nick Bowman and Sven Joeckel for providing us with data for the preliminary analyses from the cited study.

[8] "I am proud of my country's history" was replaced by "It is more important to be a team player than to express oneself".

individual outcomes (M/Soc) and moral focus on organization versus opportunity (M/Org). We allowed five moral concerns to load on either factor (see right-hand side of Figure 2B). In addition, because one common (method) factor yielded partially nonsignificant loadings, two correlated common method factors were included, with items of each subscale (relevance and judgment) loading on the respective method factor (see left-hand side of Figure 2B). In order to achieve model identification, we fixed factor means to zero and the parameter with the highest loading on the respective latent factor to one (after a first iteration with one random fixation). We also fixed both factor loadings of care and fairness on M/Soc to one. Due to negative variance estimates (Heywood cases), we fixed the residual variance of care to zero for the self-rater and twin-pair subsample, and the residual variance of authority to zero for the self-rater subsample. Model fit results met the aforementioned criteria (RMSEA = .046–.057, SRMR = .051–.058). The models supported metric measurement invariance, because their fit did not deteriorate significantly when factor loadings were fixed across dependent dyads and independent groups (self-rater: $\Delta\chi^2_{SB} = 55.82$, $\Delta df = 70$, $p = .891$; twin: $\Delta\chi^2_{SB} = 24.22$, $\Delta df = 36$, $p = .933$; multi-rater: $\Delta\chi^2_{SB} = 13.81$, $\Delta df = 17$, $p = .680$). Tables B1 and B3 in supplement B provide model estimates and model fit statistics.

Openness to Experience and Honesty-Humility. Participants completed the German 60-item version of the HEXACO Personality Inventory-Revised (Ashton & Lee, 2009) that measures the Big Six personality trait dimensions, including openness to experience and honesty-humility. For a psychometric examination of the German version, see Moshagen, Hilbig, and Zettler (2014). Participants were instructed to express their agreement with self-/target-descriptive statements on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Tables A5 and A6 in supplement A provide descriptive statistics. We ran CFAs, with six correlated personality domain factors. Model fit was satisfactory across subsamples (RMSEA =.044 –.052, SRMR = .069–.070). χ^2 difference tests yielded metric measurement invariance

for the self-rater ($\Delta\chi^2_{SB}$ = 129.20, Δdf = 108, p = .080) and twin subsample ($\Delta\chi^2_{SB}$ = 70.13, Δdf = 84, p = .861), but not for the multi-rater subsample ($\Delta\chi^2_{SB}$ = 166.72, Δdf = 84, p < .001). However, the alternative fit index (ΔCFI = .002) justified the assumption of metric measurement invariance for this subsample as well. Tables B4 and B5 of supplement B provide model fit statistics (including χ^2 test statistics) and parameter estimates.

We computed mean scores. In addition, for analyses across rater perspectives, we obtained latent factor scores from a model including eight latent factors (six personality factors and two method factors). In this model, we fixed the two self-report and informant-report indicators of the same personality trait, and all rater-specific indicators on the respective rater-specific method factor. Model fit was satisfactory (RMSEA = .056, 90% CI [.046, .067], SRMR = .026). Table B6 in supplement B provides the model coefficients.

Latent Factor Scores. To obtain individual scores on the value and moral focus dimensions, we computed latent factor scores. We used the partial least squares regression method (Thomson, 1934; Thurstone, 1935) based on the conducted hierarchical CFAs (assuming metric measurement invariance). By including common method factors, factor scores represented quasi-ipsatized values. That is, variance due to response tendencies (e.g., acquiescence, central tendency bias, and social desirability) could be partialed out. Thus, this approach allowed us to disentangle systematic and unsystematic error variance from true score variance resulting in error-corrected factor scores.

The factor scores of value orientations and foci of moral concern can be interpreted as follows: The sign of the score indicates the individual orientation towards either higher-order value and the absolute value of the score indicates the extent to which the individual gives priority to the respective higher-order value. For V/Sel, a positive score indicates a preference for self-transcendence, whereas a negative score indicates a prioritization of self-enhancement. Similarly, a higher moral focus on social outcomes is reflected by a positive

M/Soc score, whereas a negative score represents a focus on individual outcomes (i.e., little concern for social outcomes). A positive score for V/Con indicates a prioritization of conservation, while a negative V/Con score reflects an orientation towards openness to change. Analogously, a positive score for M/Org represents a higher moral focus on organization, and a negative score represents a higher focus on opportunity (i.e., little concern for organization). Table 1 provides standard deviations of the dimensions for each subsample and Table 2 shows self-other agreements and twin correlations.

Analyses & Results

All structural equation models were run using R/RStudio and the package lavaan, except for the twin models, for which we used IBM SPSS Amos 24.0.0 (Arbuckle, 2016). The model parameter estimates were derived with MLR for all analyses in R and maximum likelihood estimation procedures in Amos. We applied the same model fit criteria as already introduced for the CFAs. Nested models were compared using the χ^2-difference test. Non-nested models were descriptively compared using RMSEA, comparative fit index (CFI), and expected cross-validation index (ECVI; Browne & Cudeck, 1993). A smaller RMSEA and ECVI and a larger CFI indicated superior model fit.

Structural Convergence across Rater Perspectives: Multitrait-Multirater Analyses

Convergent constructs should show a common structural basis (i.e., a common latent factor) across different methodological approaches. In order to identify the amount of common variance, we performed extended multitrait-multirater (MTMR) analyses using structural equation modeling of the individual factor scores based on self- and informant reports (see Figure 3). MTMR analyses allow for the differentiation between construct-valid variance as evidenced across methods and method variance across traits. This enabled us to avoid misjudging artifactually high correlations between two variables as evidence for

dimensional convergence. It also enabled us to compare the amount of convergent variance with the amount of rater-specific (method) variances.

In addition, we sought to discriminate the variance specific to each value orientation or focus of moral concern. This variance – in the following called *dimension-specific* – may reflect instrument-specific factors due to the measurement instrument (PVQ and MFQ) and construct-specific factors. However, the modeled factors specific to the value orientations and foci of moral concern should largely account for dimension-specific variance, because instrument-specific variance would have been largely partialed out by the included common method factors in the CFA-based procedure to compute factor scores.[9] Consequently, we could compare variance due to a common factor with rater- and dimension-specific variance.

The full MTMR model depicted in Figure 3 included nine latent factors: one *common* factor, two *method* (or *rater-specific*) factors for self- and informant assessments, and two *dimension*-specific factors for the respective value and moral focus dimension, and four *residual* (or *error*) components. All path coefficients were fixed to one and factor means were set to zero in order to identify factor variances. To test for more parsimonious models, we compared the full model with a model (1) without dimension-specific factors, (2) without method factors, and (3) without a common factor. A significant and comparably larger

[9] Initially, we ran models comprising all four dimensions (V/Sel, V/Con, M/Soc, and M/Org) to disentangle variance specific to the respective dimension from instrument-specific variance. However, the analyses did not yield an adequate model fit (RMSEA > .080). This was likely attributable to three reasons: (1) little to no correlation among common and method factors, (2) an insufficient number of indicators, and (3) the consideration of common method factors in generating the latent factor scores. The first and the second issues are requirements for successful model convergence and satisfactory model fit (Eid et al., 2003). The third reason leads to extraction of the shared variance of all items within a measure and method (i.e., rater perspective), rendering estimation of a shared "measure" factor across ratings of all rater perspectives unworkable. Given the advantages of including the method factors in the context of socially desirable constructs and their convergence, we retained the procedure and computed the models for both dimensions separately.

amount of common factor variance in the presence of the other components would indicate a dimensional convergence of value orientations and foci of moral concern (in line with H1a and H2a).

V/Con and M/Org. The full model yielded the best fit (χ^2= 0.210, *df* = 1, *p* = .646, RMSEA=.000, 90% CI [.000, .000], SRMR = .002). For standardized path coefficients, see Figure 4. The higher loadings of each variable on the common world belief factor compared to their loadings on the method and dimension-specific factors indicated that V/Con and M/Org converged on a structural basis. The common factor accounted for the largest proportion of variance in self- and informant-rated value and moral focus scores, albeit to a different degree for V/Con (59–79%) and M/Org (45–54%). Dimension-specific factors explained the second largest variance component (except for self-reported V/Con), considerably more so for M/Org (31–36%) than for V/Con (13–18%). Method factors explained a negligible proportion of variance in informants' scores (< 1%) and a small variance proportion in self-report scores (12–15%). Thus, while showing substantial structural convergence with V/Con, confirming H1a, variance in M/Org was also considerably attributable to dimension-specific aspects.

V/Sel and M/Soc. The full MTMR model showed the best model fit (χ^2= 0.235, *df* = 1, *p* = .627, RMSEA=.000, 90% CI [.000, .065], SRMR = .004). See Figure 5 for the model including standardized path coefficients. Variance in V/Sel was primarily dimension-specific (48–49%), with small components accounted for by the common factor (14–15%) and a small component attributable to rater specificity (1–9%). The common factor explained substantial variance in self- and informant reports of M/Soc (58–87%) in contrast to a negligible dimension-specific factor (1%). Rater specificity moderately explained variance in informants' M/Soc scores (35%), but marginal variance in self-report M/Soc scores (2%). These results did not support H2a. Rather, the common factor variance might represent

variance in M/Soc largely overlapping with a proportion of variance in V/Sel. This might be due to the comparably low variance in M/Soc scores (see Table 1).

Commonality in Age Trends across Sexes: Multiple Regression Models

Convergent constructs should show similar age trends and similar sex effects. We tested for age and sex effects in each of the three subsamples. Inspired by the approach of Srivastava, John, Gosling, and Potter (2003), we first computed regression models including linear, quadratic (age^2), and cubic (age^3) age terms with and without a sex term and sex × age (age^2, age^3, respectively) interaction terms, and identified the best fitting within-construct model separately for each subsample and reported dimension. We then selected the best model for both the value and moral focus dimensions. Finally, we computed standardized difference scores (e.g., z-scores of M/Org subtracted from z-scores of V/Con) as further criterion variables to estimate whether intra-individual score differences between potentially convergent dimensions (e.g., V/Con and M/Org) were affected by age and sex effects. Significant effects would indicate that age and (or) sex affect the two dimensions differently. To facilitate regression coefficient comparisons, we standardized regression terms as well as predicted scores. More specifically, sex was mean-centered (i.e., values were rescaled by subtracting the mean), and age as well as the respective criterion variable (scores of V/Con, M/Org, V/Sel, M/Soc, and the used difference scores, namely V/Con–M/Org and V/Sel–M/Soc) were mean-centered and divided by two standard deviations (Gelman, 2008) using the R package arm (Gelman & Su, 2018). For the multi-rater subsample, we used scores based on the variance component shared by self- and informant ratings via latent variable modeling.

V/Con and M/Org. Figure 6 presents grouped mean scores of V/Con and M/Org and scores predicted by age and sex for all subsamples. Predicted scores are based on the best fitting within-construct regression models. Table 3 provides model statistics of within- and cross-construct regression models. V/Con and M/Org showed descriptively similar age trends

in all three subsamples. Overall, participants younger than 45 years of age tended to be comparably more open to change and more focused on opportunity, and older participants were more oriented towards conservation and morally focused on organization. However, predictions significantly differed in magnitude across subsamples, suggesting that age-related effects differed between dimensions for certain age groups.

Noteworthy, within- and cross-construct regression analyses showed that sex effects on M/Org differed from those on V/Con. Females attributed greater importance to conservation than males did across all ages and samples. For M/Org, results differed between samples. We found significant sex × age interaction effects in the self-rater and twin subsamples. Males were more focused on organization than females for participants between 14 and 40 years of age, and females were more focused on organization than males for older participants. This was again reversed for participants older than 75 years of age in the twin subsample. We did not find a significant sex effect on M/Org in the multi-rater subsample. Thus, despite similar trends, H1b could not be confirmed from a strict point of view.

V/Sel and M/Soc. Figure 7 presents grouped mean and predicted scores of V/Sel and M/Soc by age and sex for each subsample. Table 4 presents model statistics of within- and cross-construct regression models. Age effects markedly differed between V/Sel and M/Soc. These differences varied between subsamples. In general, participants' value priorities shifted from self-enhancement towards self-transcendence over the life course. In contrast, we found no significant age differences for M/Soc in the self-rater sample and only small differences in the multi-rater sample. Moreover, the analyses yielded a significant sex × age interaction for M/Soc in the twin subsample. The interaction suggested that sex differences diminish with increasing age. Analyses based on the self- and multi-rater subsample yielded consistent sex differences in V/Sel and M/Soc. Women prioritized self-transcendence and tended to focus on social outcomes (except for participants of an advanced age within the twin subsample),

whereas men attributed more importance to self-enhancement and tended to focus on individual outcomes. In sum, however, H2b had to be rejected.

Common Sources of Individual Differences: Bivariate Twin Modeling

Variance in convergent constructs should not only show similar contributions of genetic and environmental sources but should also be due to common genetic and environmental sources rather than attributable to unique sources of variance (H1c and H2c). To identify the proportion of common sources contributing to individual differences in both dimensions, we ran bivariate twin model analyses. The analysis of differences within and between twin pairs reared together allows estimations of genetic and environmental sources of the variance in a variable and the covariance between two variables. MZ and DZ twins differ in their genetic relatedness: MZ twins are genetically identical, whereas fraternal twins share on average 50% of their segregating genes. Thus, under the assumption that environmental sources shared within twin pairs reared together (e.g., household, neighborhood) equally contribute to the similarities within both MZ and DZ twin pairs, differences between MZ and DZ twin pair correlations are attributable to additive genetic sources (*A*). Low differences between MZ and DZ twin pair similarities suggest crucial environmental sources shared by twins (*C*) that act to increase both MZ and DZ twin similarity. Because MZ twin siblings share their entire genetic make-up, differences between MZ twin siblings inevitably originate from environmental sources not shared by twins (*E*, including random error). Following this logic, structural equation models in the form of bivariate *ACE* twin models enable us to disentangle variance components common and specific to two variables (see Figure 8).

Note that the used twin model approach relies on the assumptions of the absence of nonadditive genetic sources of variance, gene-environment correlations, and gene × environment interactions. Thus, the twin model can only estimate the net contributions of genetic and environmental sourcesthat can trans- and interact in very complex ways

(Bleidorn, Kandler, & Caspi, 2014; Briley, Livengood, & Derringer, 2018; Kandler & Zapko-Willmes, 2017).

Age and sex effects may act to increase or decrease estimates of twin similarities and thus estimates of genetic and environmental variance components (McGue & Bouchard, 1984). We therefore calculated unstandardized residual scores for value orientations and foci of moral concern based on the best fitting regression models of age and sex effects. In addition, nonrandom mating between individuals of similar heritable phenotypes (*assortative mating*) might act to increase the genetic relatedness of their offspring. Assuming an average proportion of 50% of shared segregating genes between DZ twin siblings (as would be the case under random mating of twins' parents) would then result in an underestimation of the differences between MZ and DZ twin pair correlations. As a consequence, the genetic component would be underestimated and shared environmental sources on twin pair similarity would be overestimated. Since data of some twins' parents were available in the SPeADy data, we were able to take assortative mating of the twins' parents into account and adjust the genetic correlation between DZ twins.[10]

We ran a common pathway model analyses to disentangle genetic and environmental variance components shared by and specific to value orientations and foci of moral concerns (see Figure 8). The model consists of a common factor mediating the common genetic and environmental variance components of the linked value and moral focus dimensions, in

[10] Since parents' scores were significantly correlated for V/Con ($r = .39$, $p < .001$) and M/Org ($r = .40$, $p < .001$), the genetic correlation of DZ twins (γ) was corrected based on the estimated heritability [$h^2 = 2 \times (r_{MZ} - r_{DZ})$] and spouse similarity (μ; Martin et al., 1986; Stieger, Kandler, Tran, Pietschnig, & Voracek, 2017): $0.5 + 0.5 \times h^2 \times \mu = 0.5 + 0.5 \times .44 \times .39 = 0.59$ for V/Con, and $0.5 + 0.5 \times .07 \times .40 = 0.51$ for M/Org. We used the averaged correction, $\gamma_c = .55$, for the genetic correlation of the common factor in the common pathway model (see the following section). For V/Sel and M/Soc, parents' scores were not significantly correlated ($r = .19$, $p = .075$, and $r = .09$, $p = .376$), thus a correction was not necessary and the genetic correlation remained at $\gamma = .50$ for DZ twins.

addition to variance components unique to both dimensions. We started with the full model (as depicted in Figure 8) and subsequently removed nonsignificant paths to achieve the most parsimonious model with a model fit not significantly worse than the full model.

V/Con and M/Org. The fit of the full model was satisfactory (χ^2 = 20.807, *df* =12, *p* = .053; RMSEA = .036, 90% CI [.000, .062], CFI = .991, ECVI = .095). Figure 9A presents the standardized path coefficients of the most parsimonious model (see Table C1 in supplement C for full and parsimonious model statistics). Variance in V/Con was moderately attributable to additive genetic factors (47%), followed by shared environmental (33%) and nonshared environmental (20%) factors. In contrast, shared environmental factors substantially contributed to the variance in M/Org (61%), followed by nonshared environmental (22%) and additive genetic factors (17%). The common factor explained a proportion of 38% of V/Con variance and 55% of M/Org variance. All additive genetic effects on M/Org were mediated via the common factor, whereas V/Con showed additive genetic variance (35%) not mediated by a common factor. Thus, we could only partially confirm H1c. The results point to V/Con and M/Org possibly reflecting characteristics of different personality layers.

V/Sel and M/Soc. The model fit was sufficient (χ^2 = 51.153, *df* = 13, *p* < .001; RMSEA = .073, 90% CI [.053, .094], CFI = .920, ECVI = .147). Figure 9B depicts the standardized path coefficients (see Table C2 in supplement C for the full and parsimonious model statistics). Nonshared environmental sources accounted for 39% of variance in V/Sel and M/Soc, with smaller additive genetic (V/Sel: 34%, M/Soc: 24%) and shared environmental (V/Sel: 27%, M/Soc: 37%) sources of variance. The common factor mediated only a small, exclusively environmental proportion of variance in V/Sel (17%), and more than half of the variance in M/Soc (57%) including the complete shared environmental component of M/Soc. Since the model analyses suggested no significant common genetic component,

H2c could not be confirmed. The results point to V/Sel and M/Soc as environmentally related, but genetically distinct constructs.

Associations with Personality Traits: Correlation and Semipartial Correlation Analyses

In line with previous findings, value and moral focus dimensions should be associated with certain personality trait dimensions. More specifically, openness to experience should be negatively associated with V/Con and M/Org, and honesty-humility should show positive links with V/Sel and M/Soc. In addition, as we assumed the common factors to reflect fundamental world beliefs, the respective personality trait dimension should be more strongly associated with the common factor than the specific value or moral concern dimension. This would indicate that associations between personality trait dimensions and value orientations or moral foci are due to, or at least (partially) mediated by, their common factors.

To examine the links, we ran zero-order and semipartial correlation analyses within rater perspectives (i.e., for self- and informant reports) and across rater perspectives. Semipartial correlation analyses allowed us to control for mediating effects due to other personality trait dimensions not expected to be primarily linked with value orientations and moral foci: emotionality, extraversion, agreeableness, and conscientiousness. In addition, we tested whether the value orientation mediated the association between the respective personality trait and the complementary focus of moral concern or vice versa. This would further indicate that the dimensions represent the same or different personality layers in terms of dispositions versus characteristic adaptations (Asendorpf & Motti-Stefanidi, 2018; Kandler et al., 2014). For multi-rater analyses, we used the CFA-based factor scores of the personality trait dimensions and the analogous common and dimension-specific factors of the paired value dimension and focus of moral concern. Semipartial correlation analyses were run based on the R package ppcor (Kim, 2015).

V/Con and M/Org. V/Con showed a higher (negative) correlation with openness to experience than M/Org did for both self- and informant reports (see Table 5; William's test: $t_{self} = -4.28$, $p < .001$; $t_{twin} = -3.26$, $p = .001$; $t_{target} = -2.32$, $p = .020$; $t_{informant} = -4.28$, $p < .001$). Controlling for the other personality trait dimensions did not diminish these links (see Table D1 in supplement D for zero-order correlations between the other four personality traits and V/Con or M/Org). However, when controlling for the complementary value or moral focus dimension, the association decreased in size in line with the expectation that openness to experience is primarily linked with a common component of V/Con and M/Org. The decline of the link was more substantial (i.e., towards non-significance) for M/Org than for V/Con, indicating that V/Con mediated the association between openness to experience and M/Org, rather than vice versa. The size of the correlation between V/Con and M/Org was not markedly reduced after controlling for all personality trait dimensions. Thus, their link was not substantially mediated or accounted for by any of the other HEXACO personality trait dimensions. The multi-rater analysis yielded that the common factor of V/Con and M/Org showed a stronger (negative) link with openness to experience than the dimension-specific factors, especially than the M/Org-specific factor (Williams's test: $t_{V/Con} = -5.06$, $p < .001$, $t_{M/Org} = -6.52$, $p < .001$). This supported the findings based on single rater perspectives insofar as this common factor primarily accounted for (or mediated) the association between openness to experience and M/Org or V/Con. Thus, we could confirm H1d.

V/Sel and M/Soc. Within rater perspectives, V/Sel showed a higher positive correlation with honesty-humility than M/Soc (see Table 6; William's test: $t_{self} = 14.79$, $t_{twin} = 16.02$, $t_{target} = 12.12$, $t_{informant} = 14.21$, all $p < .001$). Partialing out the other personality trait dimensions did not substantially diminish the association for both (see Table D2 in supplement D for zero-order correlations between the other four personality traits and V/Sel or M/Soc). However, while controlling for M/Soc did not reduce the correlation between

V/Sel and honesty-humility, the link between M/Soc and honesty-humility disappeared when V/Sel was controlled. Thus, honesty-humility did not explain variance in M/Soc beyond the common variance with V/Sel. In other words, V/Sel completely mediated the link between honesty-humility and M/Soc. In addition, the correlation between M/Soc and V/Sel decreased when honesty-humility was controlled. This might be due to the substantial correlation between V/Sel and honesty-humility ($r > .60$). The multi-rater analysis yielded that the common factor of V/Sel and M/Soc was considerably less strongly correlated with honesty-humility than the dimension-specific V/Sel component (Williams's test: $t = –8.20$, $p < .001$). The M/Soc-specific factor was not significantly correlated with honesty-humility. Consequently, H2d had to be rejected. Considering that the common factor largely explained variance in M/Soc and only modestly in V/Sel (see MTMR analyses), the common factor might largely represent the proportion of variance in M/Soc accounted for by V/Sel.

Discussion

We investigated the links between basic value orientations and foci on moral concern and examined their structural, age-related, and source-related convergence as well as their common links with specific personality trait dimensions. The analyses only partially confirmed our hypotheses, casting doubt upon the convergence of basic value orientations and foci on moral concern. A reasonable case can be made for V/Con and M/Org, because they show substantial structural convergence (H1a) primarily associated with openness to experience (H1d) and in part comparable age trends across sexes (H1b). However, twin model analyses yielded substantial genetic components specific to V/Con and shared environmental components specific to M/Org (contradicting H1c). In case of V/Sel and M/Soc, all hypotheses (H2a-d) had to be rejected pointing to the conclusion that they reflect distinct characteristics. We next discuss the findings in greater detail regarding conceptual and measurement-related implications.

V/Con and M/Org: Distinct Characteristics with a Common Genetic Basis

Considering their substantial structural convergence across different rater perspectives, their similarity in age trends, and their common association with openness to experience, V/Con and M/Org could be seen as reflections or operationalizations of the same underlying construct, such as individual differences in the extent of a dangerous world belief. However, the overall assessment of findings derived from our analyses leaves room for doubt. Differences in the size of age and sex effects as well as genetic and environmental sources suggest that V/Con and M/Org reflect closely linked dimensions, but do not represent the same psychological construct. They rather can be seen as different constructs located at different layers of personality – in line with different positions of rather dependent and predicting variables within the DPM model.

V/Con is less environmentally malleable, shows stronger links to the personality trait openness to experience, and mediated the entire genetic sources contributing to the variance in M/Org as well as the association between openness to experience and M/Org rather than vice versa. This suggests that V/Con may reflect a more dispositional variable – for example, individual differences in a dangerous world belief within the DPM framework. M/Org can be seen as characteristic adaptation, which is partially influenced by V/Con but primarily determined by environmental sources (Asendorpf & Motti-Stefanidi, 2018; Kandler et al., 2014). The latter is in line with previous behavior genetic findings on the sources of variance in associated moral concerns (Smith et al., 2017). Thus, the findings suggest that M/Org represents a more flexible response to socio-environmental factors. In other words, people's concern for transgressions of authority, loyalty, and sanctity derives both from their dispositional preference for conservation versus openness to change and from environmental factors, that are primarily shared by siblings reared together. These environmental factors may represent both early rooted familial experiences and a "shared reality" in micro- and

macrosocial contexts that shape individual differences in moral concerns, such as the family, neighborhood, school, residence, peers, culture, and society.

Individual differences in M/Org may be reinforced through existential individual experiences that transact with existential motives, such as the needs for security and stability in the face of threat. V/Con may reflect the conscious representation of these existential motives to manage threat and the search for security and stability (Jost, Federico, & Napier, 2009; Jost, Glaser, Kruglanski, & Sulloway, 2003). Past research on socio-political attitudes has shown that people adopt more conservative attitudes following threat-inducing events (e.g., terror attacks; Bonanno & Jost, 2006; Echebarria-Echabe & Fernández-Guede, 2006; Huddy & Feldman, 2011), enduring threatening circumstances (Doty, Peterson, & Winter, 1991; McCann, 1997; Sales, 1973), and prospective threats (e.g., due to global warming; Fritsche, Cohrs, Kessler, & Bauer, 2012; for meta-analyses, see Onraet, Van Hiel, Dhont, & Pattyn, 2013, and Jost, Stern, Rule, & Sterling, 2017). This might result from adaptive changes in the moral evaluation of certain political actions and of their necessity in the face of threat. Thus, threatening events may affect people's (moral) justification for certain political steps in times of threat, even though they do not necessarily act to alter people's core motives and associated value priorities (but see Verkasalo, Goodwin, & Bezmenova, 2006, for findings on short-term changes in values).

In addition to the existential motives noted above, Jost et al. (2009) argued that epistemic and relational motives may provide a motivational basis of conservatism. Relational motives refer to the drive for affiliation, political and social identification, and need for shared reality and solidarity. Those relational motives might induce deviation from individual motivational goals in favor of agreement within one's social context regarding "right" and "wrong". This "shared reality" is important in forming and maintaining interpersonal relationships (Hardin & Conley, 2001; Jost, Ledgerwood, & Hardin, 2008). Hence, the

environmental variance in M/Org may partly reflect differences in social contexts (families, friends, peers, communities, and other social groups) with which individuals seek to maintain a shared reality (e.g., regarding the moral relevance of sanctity and purity). These shared realities may be primarily shared by twins reared together and could account for the large shared environmental component in M/Org compared to V/Con. The latter is also in line with a conceptualization of M/Org as characteristic adaptation that is more environmentally malleable than V/Con.

V/Sel and M/Soc: Distinct Characteristics with a Common Environmental Basis

We found the convergence between V/Sel and M/Soc to be unbalanced: A large component of M/Soc overlapped with a small component of V/Sel. This overlap was exclusively environmental, primarily due to environmental sources shared by twins reared together. Different genetic sources account for the variability in V/Sel and M/Soc. Sex effects on both were similar, but age effects differed. In addition, V/Sel was substantially linked with honesty-humility and completely mediated the small association between honesty-humility and M/Soc. We therefore inferred that V/Sel and M/Soc represent genetically distinct characteristics that are environmentally linked, in the sense that most of environmental differences in M/Soc (75%) primarily represents a small environmental proportion of V/Sel (25%). The common environmental basis may reflect substance or even measurement artifact.

On the one hand, the unbalanced environmental overlap between M/Soc and V/Sel may be due to factors that have a strong influence on moral judgments of care and fairness, but a modest influence on preferences for self-transcendence vs. self-enhancement. These may include critical events as described for M/Org, but also factors within the family environment, such as parental warmth and control.

On the one hand, the smaller total and relatively large shared environmental variance in M/Soc may be due to the fact that most people tend to agree with the content of items (i.e.,

high relevance of care and fairness), perhaps due to social desirability that acts to decrease total variance in M/Soc but increases within-family resemblance regarding moral judgments in this regard. The measurement of V/Sel may also be biased by socially desirable responding, but it has the advantage of a more indirect approach to capture goal preferences that relate to social versus individual outcomes. Modeling moral concerns as trade-offs between moral consequences may more accurately reflect the moral dilemmas that are commonly used in moral psychological research. This measurement strategy might help not only to mitigate response biases such as socially desirable responding, but also to uncover even stronger differences in moral concerns between people.

Beyond the unbalanced environmental overlap and the distinctiveness of genetic sources of variance in M/Soc and V/Sel, the genetic component in M/Soc was smaller compared to the genetic variance in V/Sel, indicating different (core vs. surface) characteristics at different layers of personality (Kandler et al., 2014). The primary environmental malleability of M/Soc – in line with a previous twin study (Smith et al., 2017) – indicates that M/Soc may reflect a characteristic adaptation rather than a dispositional personality characteristic. The latter may be a reasonable category for V/Sel, since it shows moderate heritability, substantial overlap with honesty-humility, and can be captured in children within the first decade of life (see Kandler et al., 2016). In contrast to the relationship between V/Con and M/Org, however, our analysis yielded no genetic overlap between M/Soc and V/Sel. That is, V/Sel does not mediate the dispositional genetic core of M/Soc, indicating that different dispositional variables may play a role. For instance, the partial overlap may be due to a third characteristic that influences moral judgments of care and fairness strongly, but preferences for self-transcendence versus self-enhancement only modesty. Constructs that have been linked to these dimensions, as well as personality trait dimensions and ideological attitudes, such as empathy (e.g., Álvarez-Castillo, Fernández-Caminero, & González-

González, 2018; Pohling, Bzdok, Eigenstetter, Stumpf, & Strobel, 2016; Sidanius et al., 2013) may be plausible candidates.

Limitations and Future Directions

To confirm our quasi-causal interpretations of the links between value orientations and foci on moral concern, longitudinal studies are necessary. Longitudinal designs that measure ideological attitudes, value orientations, and moral foci could not only examine our claim regarding the categorization of value orientations as dispositional traits (especially given recent findings and critiques of this categorization; Fetvadjiev & He, in press), but they could also provide insight into the interplay among the present dimensions and the sociopolitical constructs of the DPM model.

Longitudinal behavior genetic studies may shed light on the nature of the common factor and the found environmental factors that affect M/Org. Do these factors reflect the proposed motives and threatening circumstances, a shared reality, or both? In addition, we could only consider self-reports in the twin models. While this is common practice, it may lead to inflated genetic estimates and correlations due to found genetic influences on response biases (Kandler, Riemann, Spinath, & Angleitner, 2010). In addition, this approach does not allow to disentangle unique environmental effects from measurement error. Our procedure in generating factor scores may have reduced the impact of certain response biases, but adopting a multi-rater twin model design would be superior in this regard.

The constructs studied in the current investigation are supposedly cross-culturally valid (Graham et al., 2016; Schwartz, 2017). Research can and should assess whether individual differences in the characteristics, their covariance, and underlying sources of variance are cross-culturally valid, especially in light of research calling this into question (Boer & Fischer, 2013).

Our findings do not necessarily have implications for other, non-pluralistic approaches to morality (e.g., Janoff-Bulman & Carnes, 2013; Schein & Gray, 2015). Thus, to achieve a broader understanding of the links between values and moral judgment, it would be worthwhile to investigate the associations between these models of morality and Schwartz' values framework.

Finally, we applied a short version of the Moral Foundations Questionnaire that may not have adequately captured the moral concerns as theoretically outlined (Haidt & Joseph, 2004, 2007). Future research on the overlap of the moral concerns and value orientations should use a broader measure of moral concerns that better captures the bandwidth of the proposed constructs.

Conclusion

The current investigation on the links of core value orientations and foci on moral concern provided strong evidence that both constructs are empirically and systematically associated, but represent distinct psychological constructs. We found evidence across different rater perspectives and genetically informative data for the argument that value orientations can be seen as core characteristics, whereas foci on moral concerns represent surface characteristics within a broad system of personality characteristics (Kandler et al., 2014). More specifically, individual differences in conservation versus openness to change potentially reflect variance in the intensity of a dangerous world belief and the conscious representation of existential motives that – beyond and in addition to environmental factors shared and not shared by twin siblings – mediate genetic and personality trait (i.e., openness to experience) influences on moral concern for authority, loyalty and sanctity. Our study further provided evidence for the argument that a moral concern for care and fairness and self-transcendence versus self-enhancement values are strongly environmentally associated but affected by different genetic sources.

Our study can and should only be seen as a first step and attempt to integrate and organize independently established but conceptually comparable frameworks within a broad system of individual differences in personality-related characteristics. While, our current findings hold the promise of advancing the understanding of the structural and source-related bases of common and distinct differences in core value orientations and foci of moral concern, they will need to be enriched by future cross-cultural and longitudinal research.

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Table 1. *Sample Descriptives*

		Age			Sex	V/Con	V/Sel	M/Org	M/Soc
Subsample	*n*	Range	*M*	*SD*	% female	*SD*	*SD*	*SD*	*SD*
Self-rater	1421	14–94	41.12	18.44	58	0.72	0.87	0.85	0.39
Multi-rater	924	14–89	39.60	18.06	66	0.74[1] / 0.63[2]	0.84[1] / 0.85[2]	0.92[1] / 0.89[2]	0.39[1] / 0.36[2]
Twin	555	14–86	38.84	19.94	73	0.71	0.82	0.82	0.38

Note. $M = 0$ for V/Con, V/Sel, M/Org, and M/Soc.

[1]Self-reports.

[2]Informant reports.

Table 2. *Self-Other and Twin Correlations*

	Value orientation				Moral focus				Steiger's *Z*-test	
	n	*r*	95% CI	*p*	*n*	*r*	95% CI	*p*	*z*	*p*
			V/Con				M/Org			
Self–other	924	.83	[.81, .85]	< .001	924	.82	[.80, .84]	< .001	0.65	.516
MZ twins	218	.81	[.76, .85]	< .001	218	.76	[.70, .81]	< .001	1.38	.168
DZ twins	337	.59	[.52, .66]	< .001	337	.72	[.66, .77]	< .001	–3.55	< .001
			V/Sel				M/Soc			
Self–other	924	.63	[.59, .67]	< .001	924	.72	[.69, .75]	< .001	–3.76	< .001
MZ twins	218	.61	[.52, .69]	< .001	218	.66	[.58, .73]	< .001	–0.97	.333
DZ twins	337	.44	[.35, .52]	< .001	337	.48	[.39, .56]	< .001	–0.64	.520

Note. Twin pair correlations are based on CFA-based factor scores (see Figure 2) corrected for age and sex effects as found by the reported multiple regression models.

Table 3. *Best fitting Within- and Cross-Construct Regressions of V/Con and M/Org on Age and Sex*

	Sex			Age								
				Age			Age^2			Age^3		
	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*
Self-rater												
V/Con	–0.07	0.03	.006	0.16	0.03	< .001	0.22	0.05	< .001			
M/Org				0.08	0.03	.002	0.28	0.05	< .001			
V/Con–M/Org	**–0.12**	0.03	< .001	**0.08**	0.03	.003	–0.06	0.05	.240			
Twin pair												
V/Con	–0.17	0.05	< .001	0.53	0.07	< .001	0.33	0.11	.002	–0.55	0.16	< .001
M/Org				0.37	0.07	< .001	0.84	0.11	< .001	–0.79	0.17	< .001
V/Con–M/Org	**–0.11**	0.04	.002	**0.15**	0.07	.037	**–0.53**	0.12	< .001	0.27	0.17	.119
Multi-rater												
V/Con	–0.09	0.03	.005	0.21	0.04	< .001	0.22	0.07	.001			
M/Org				0.14	0.04	< .001	0.36	0.07	< .001			
V/Con–M/Org	**–0.11**	0.03	< .001	**0.08**	0.03	.013	**–0.13**	0.06	.022			

Note. Sex was coded 1 for women and 2 for men. Age^2 = quadratic age predictor; Age^3 = cubic age predictor; Adj. R^2 = Adjusted R^2. Significant ($p < .05$) differences in regression weights between the compared dimensions are bold-faced. All *F*-tests statistics were significant ($p < .001$).

Table 3 (continued).

	Age × Sex Interaction							
	Age			Age^3			Model	
	β	*SE*	*p*	β	*SE*	*p*	Adj. R^2	*F*
Self-rater								
V/Con							.05	26.03
M/Org	–0.11	0.05	.038				.04	18.80
V/Con–M/Org	0.01	0.05	.851				.02	7.68
Twin pair								
V/Con							.13	33.18
M/Org	–0.38	0.12	.002	0.51	0.23	.027	.08	19.95
V/Con–M/Org	0.09	0.13	.493	–0.08	0.25	.756	.08	16.17
Multi-rater								
V/Con							.08	29.23
M/Org							.08	39.20
V/Con–M/Org							.02	7.71

Table 4. *Best fitting within- and cross-construct regressions of V/Sel and M/Soc on age and sex*

	Sex			Age								
				Age			Age^2			Age^3		
	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*
Self-rater												
V/Sel	–0.25	0.03	< .001	0.29	0.03	< .001	–0.13	0.05	.010			
M/Soc	–0.26	0.03	< .001									
V/Sel–M/Soc	0.00	0.03	.942	**0.33**	0.03	< .001	**–0.19**	0.06	.001			
Twin pair												
V/Sel	–0.31	0.03	< .001	0.43	0.05	< .001				–0.45	0.10	< .001
M/Soc	–0.20	0.03	< .001	–0.08	0.03	.005						
V/Sel–M/Soc	**–0.11**	0.04	.005	**0.56**	0.06	< .001				**–0.56**	0.12	< .001
Multi-rater												
V/Sel	–0.27	–0.03	< .001	0.21	0.03	< .001						
M/Soc	–0.25	0.03	< .001				0.12	0.06	.043			
V/Sel–M/Soc	0.00	0.03	.943	**0.33**	0.03	< .001	**–0.19**	0.06	.001			

Note. Sex was coded 1 for women and 2 for men. Age^2 = quadratic age predictor; Age^3 = cubic age predictor; Adj. R^2 = Adjusted R^2. Significant ($p < .05$) differences in regression weights between the compared dimensions are bold-faced. All *F*-tests statistics were significant ($p < .001$).

Table 4 (continued).

	Age × Sex Interaction			Model	
	B	*SE*	*p*	Adj. R^2	*F*
Self-rater					
V/Sel				.12	66.57
M/Soc				.07	100.10
V/Sel–M/Soc				.07	38.25
Twin pair					
V/Sel				.16	69.81
M/Soc	0.18	0.07	.005	.04	17.84
V/Sel–M/Soc	**–0.16**	0.07	.028	.10	30.75
Multi-rater					
V/Sel				.10	50.67
M/Soc				.06	28.17
V/Sel–M/Soc				.07	38.25

Table 5. *Zero-order and Semipartial Correlations between Openness to Experience and V/Con, M/Org as well as their Common Factors*

			Openness to experience				M/Org			V/Con		
Sub-sample	First variable	Test stat.	Zero-order	Part (HEX)	Part (M/V)	Part (M/V+HEX)	Zero-order	Part (OP)	Part (HEX)	Zero-order	Part (OP)	Part (HEX)
Self	V/Con	*R*	**–.34**	**–.33**	**–.22**	**–.19**	**.55**	**.48**	**.46**			
		P	< .001	< .001	< .001	< .001	< .001	< .001	< .001			
	M/Org	*R*	**–.24**	**–.26**	**–.06**	**–.07**				**.55**	**.49**	**.51**
		P	< .001	< .001	.030	.012				< .001	< .001	< .001
Twin	V/Con	*R*	**–.26**	**–.21**	**–.17**	**–.12**	**.45**	**.50**	**.48**			
		P	< .001	< .001	< .001	< .001	< .001	< .001	< .001			
	M/Org	*R*	**–.17**	**–.17**	–.03	–.04				**.45**	**.51**	**.53**
		P	< .001	< .001	.368	.157				< .001	< .001	< .001
Multi:	V/Con	*R*	**–.35**	**–.34**	**–.18**	**–.16**	**.63**	**.55**	**.51**			
Target		*P*	< .001	< .001	< .001	< .001	< .001	< .001	< .001			
	M/Org	*R*	**–.29**	**–.32**	**–.07**	**–.08**				**.63**	**.56**	**.56**
		P	< .001	< .001	.024	.011				< .001	< .001	< .001

Multi:	V/Con	*R*	**–.26**	**–.26**	**–.17**	**–.17**	**.62**	**.59**	**.56**				
Informant		*P*	< .001	< .001	< .001	< .001	< .001	< .001	< .001				
	M/Org	*R*	**–.14**	**–.15**	.02	.03				**.62**	**.61**	**.62**	
		P	< .001	< .001	.533	.380				< .001	< .001	< .001	
Multi:	Common	*R*	**–.32**	**–.32**									
MTMR		*P*	< .001	< .001									
	Specific	*R*	**–.20**	**–.19**									
	V/Con	*p*	< .001	< .001									
	Specific	*r*	–.05	**–.07**									
	M/Org	*p*	.115	.033									

Note. First variable = First variable entered in the (semipartial) correlation analyses; Test stat. = Test statistic; Zero-order = Zero-order correlations; Part (M/V) = Semipartial correlation with variables in brackets partialed out from the second variable (i.e., the column variable); M/V = The complementary dimension given the first variable (M if V is the first variable and vice versa); HEX = the remaining HEXACO personality trait dimensions; OP = Openness to experience. For analyses across rater perspectives (Multi: MTMR), we used the dimension-specific factors of V/Con (= Specific V/Con) and M/Org (= Specific M/Org) and the latent common factor (= Common) from the MTMR analyses, and latent trait scores for openness derived from the CFA (see supplement B).

Table 6. *Zero-order and Semipartial Correlations between Honesty-Humility and V/Sel, M/Soc, as well as their Common Factors*

			Honesty-humility				M/Soc			V/Sel		
Sub-sample	First variable	Test stat.	Zero-order	Part (HEX)	Part (M/V)	Part (M/V+HEX)	Zero-order	Part (HH)	Part (HEX)	Zero-order	Part (HH)	Part (HEX)
Self	V/Sel	*r*	**.61**	**.57**	**.56**	**.53**	**.28**	**.15**	**.14**			
		p	< .001	< .001	< .001	< .001	< .001	< .001	< .001			
	M/Soc	*r*	**.22**	**.18**	**.07**	.04				**.28**	**.18**	**.17**
		p	< .001	< .001	.012	.143				< .001	< .001	< .001
Twin	V/Sel	*r*	**.62**	**.57**	**.59**	**.56**	**.24**	**.16**	**.12**			
		p	< .001	< .001	< .001	< .001	< .001	< .001	< .001			
	M/Soc	*r*	**.14**	**.10**	–.02	–.01				**.24**	**.20**	**.16**
		p	< .001	.001	.598	.661				< .001	< .001	< .001
Multi:	V/Sel	*r*	**.60**	**.56**	**.55**	**.52**	**.29**	**.17**	**.14**			
Target		*p*	< .001	< .001	< .001	< .001	< .001	< .001	< .001			
	M/Soc	*r*	**.21**	**.18**	.04	.04				**.29**	**.21**	**.18**
		p	< .001	< .001	.224	.264				< .001	< .001	< .001

Multi:	V/Sel	*r*	**.65**	**.55**	**.61**	**.53**	**.27**	**.13**	**.10**				
Informant		*p*	< .001	< .001	< .001	< .001	< .001	< .001	.003				
	M/Soc	*r*	**.21**	**.14**	.05	.03				**.27**	**.17**	**.13**	
		p	< .001	< .001	.167	.346				< .001	< .001	< .001	
Multi:	Common	*r*	**.34**	**.23**									
MTMR		*p*	< .001	< .001									
	Specific	*r*	**.62**	**.49**									
	V/Sel	*p*	< .001	< .001									
	Specific	*r*	.04	.00									
	M/Soc	*p*	.184	.880									

Note. First variable = First variable entered in the (semipartial) correlation analyses; Test stat. = Test statistic; Zero-order = Zero-order correlations; Part (M/V) = Semipartial correlation with variables in brackets partialed out from the second variable (i.e., the column variable); M/V = The complementary dimension given the first variable (M if V is the first variable and vice versa); HEX = the remaining HEXACO personality trait dimensions; HH = Honesty-humility. For analyses across rater perspectives (Multi: MTMR), we used the dimension-specific factors of V/Sel (= Specific V/Sel) and M/Soc (= Specific M/Soc) and the latent common factor (= Common) from the MTMR analyses, and latent trait scores for honesty-humility derived from the CFA (see supplement B).

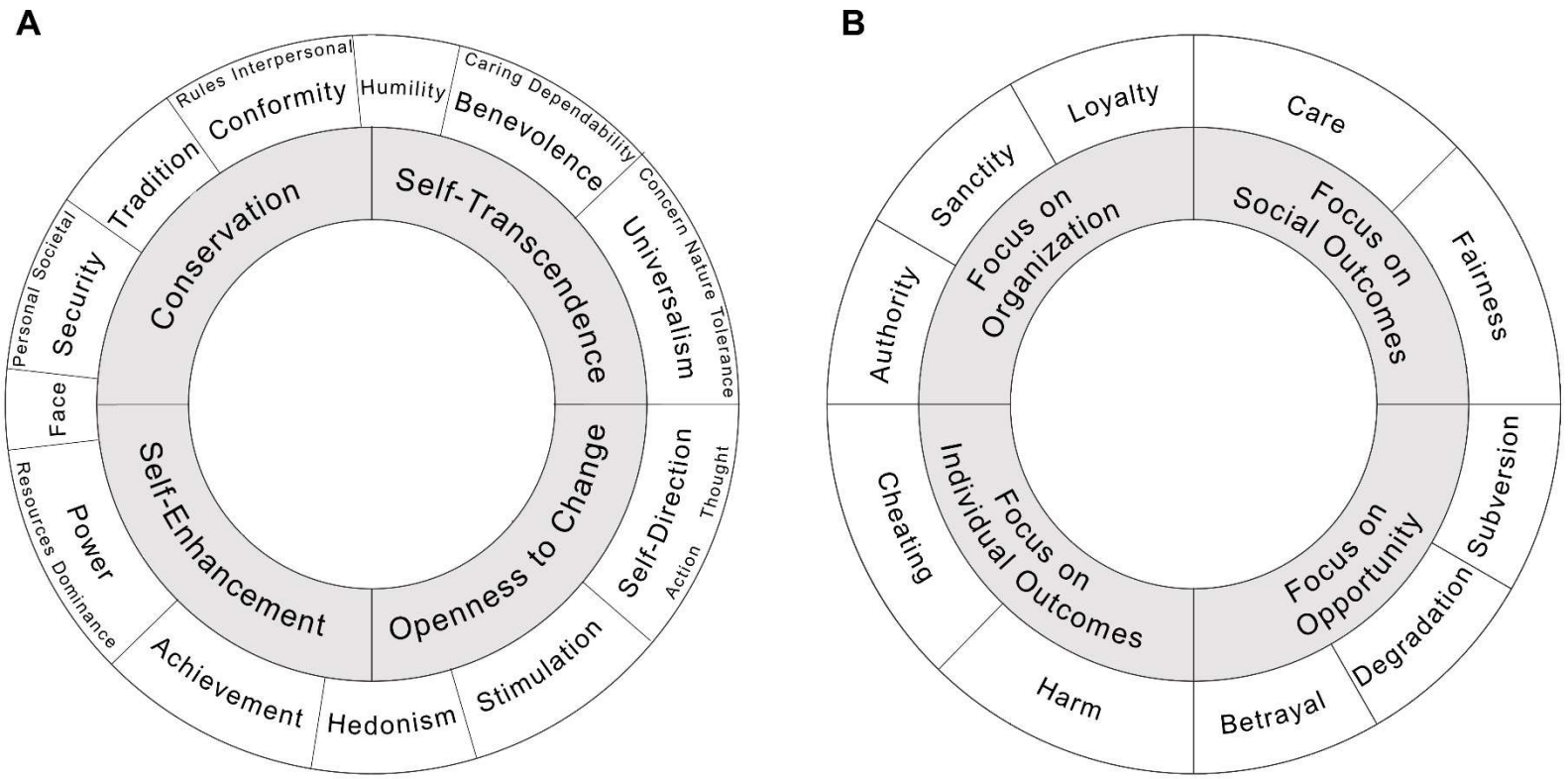
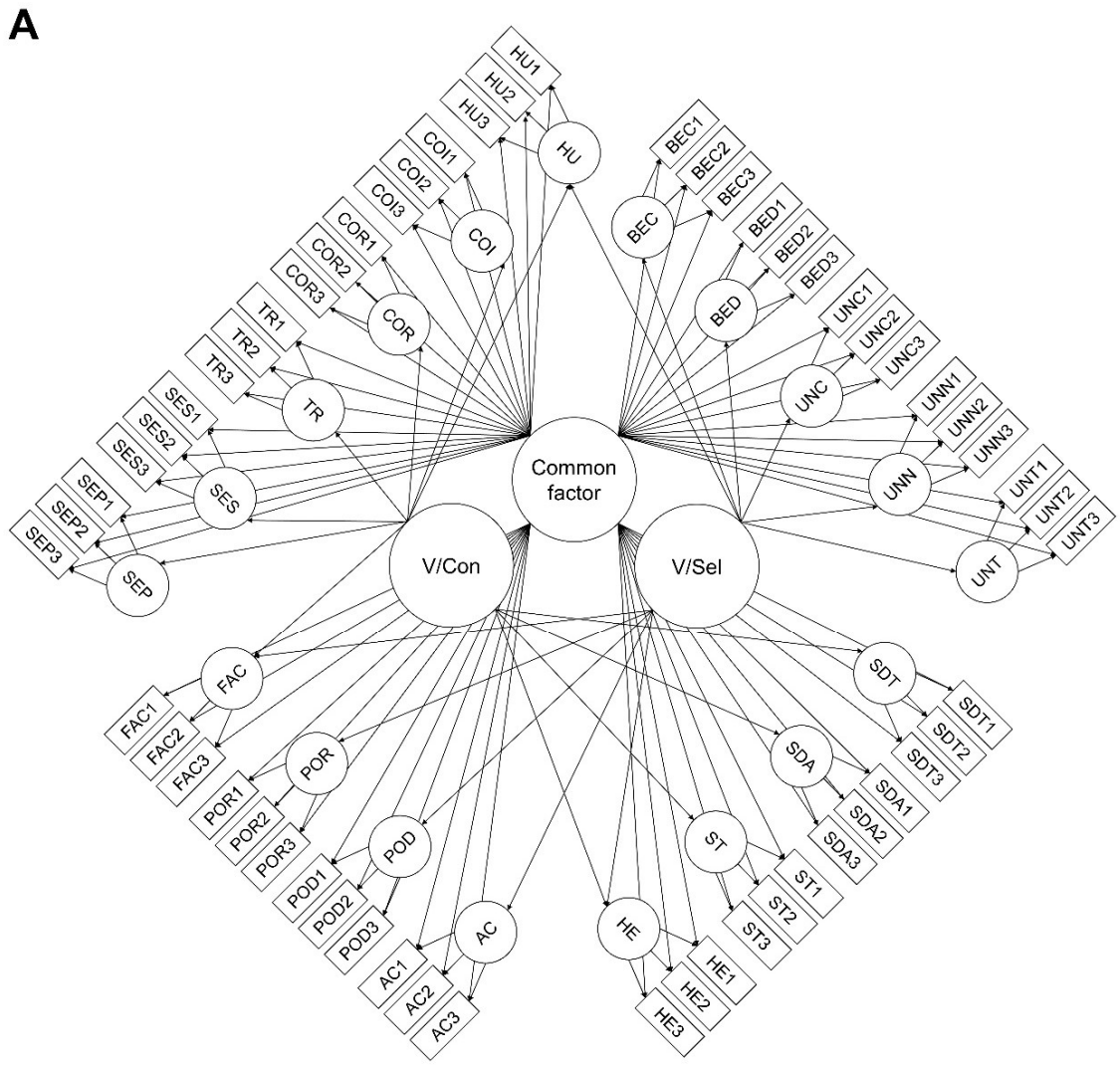


Figure 1. (A) The continuum of basic values as described by the refined theory of basic human values (Schwartz et al., 2012). Values are placed following their (in)compatibility with other values, are partially dividable into narrower defined values shown at the outer edge, and can be merged to four higher-order values, with pursuits of values of opposite sides conflicting. For value definitions, see text. (B) An adapted schematic overview of moral concerns and higher-order moral foci based on the moral foundations theory (Haidt & Joseph, 2007). The degree of

endorsement of the five moral concerns is depicted through implied (social) consequences at opposing sides, with the upper part of the figure showing a high moral concern for the respective domain, and the lower part showing a low concern for, or disapproval of, issues pertaining the respective domain. Moral concerns can be pooled into two foci of moral concern – shown in the inner circle – that reflect a high moral focus on the respective domain (focus on organization, focus on social outcomes) or a low moral focus or an endorsement of opposite behaviors (focus on opportunity, focus on individual outcomes). Apart from moral concerns belonging to the same focus factor, adjacent endorsed social consequences (e.g., fairness and subversion) are not necessarily correlated; the array was primarily chosen to parallel the illustration of basic values.


A
Common factor
V/Con
V/Sel
HU
HU1
HU2
HU3
COI
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COI2
COI3
COR
COR1
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TR
TR1
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TR3
SES
SES1
SES2
SES3
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SEP2
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HE
HE1
HE2
HE3
ST
ST1
ST2
ST3
SDA
SDA1
SDA2
SDA3
SDT
SDT1
SDT2
SDT3

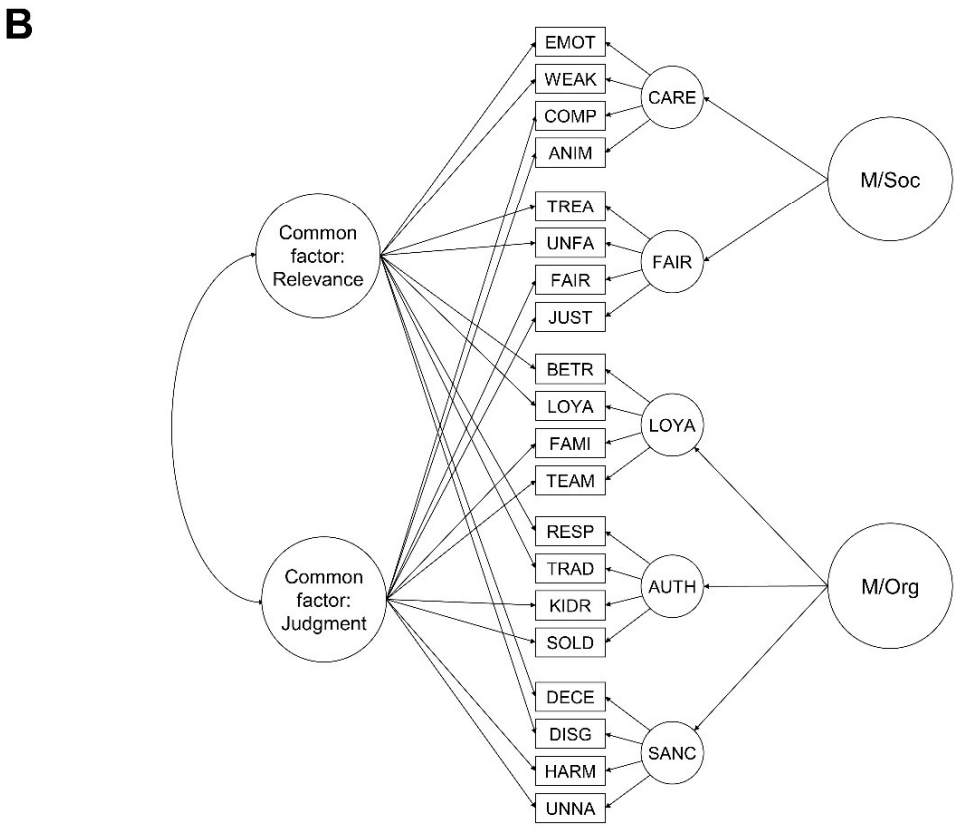
B
Common factor: Relevance
Common factor: Judgment
EMOT
WEAK
COMP
ANIM
CARE
TREA
UNFA
FAIR
JUST
FAIR
BETR
LOYA
FAMI
TEAM
LOYA
RESP
TRAD
KIDR
SOLD
AUTH
DECE
DISG
HARM
UNNA
SANC
M/Soc
M/Org

Figure 2. Hierarchical confirmatory factor analysis models of (A) higher-order value orientations and (B) foci of moral concern. For simplicity, residual factors and path labels are not shown. See text for model descriptions.

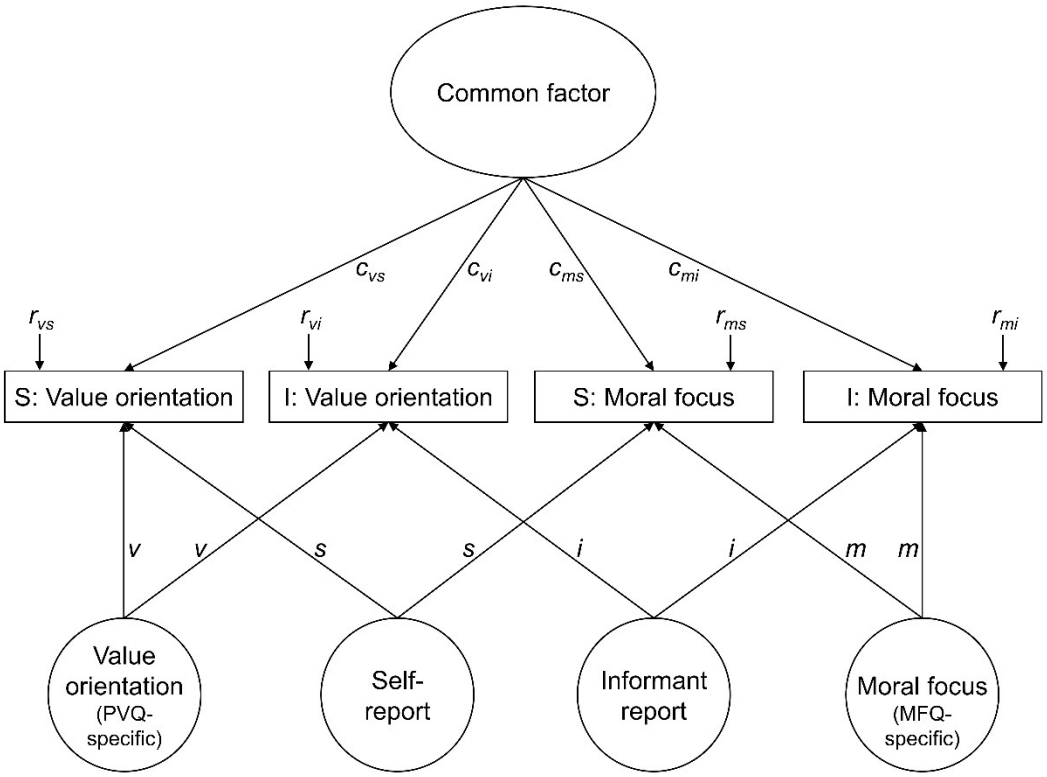

Figure 3. Multitrait-multirater model, including each target and informant report on a basic value orientation and a focus of moral concern. S = Self-report; I = Informant report; Value orientation (PVQ-specific)/Moral focus (MFQ-specific) = dimension-specific factors; Self-report/Informant report = method factors; c_{vs}/c_{vi}/c_{ms}/c_{mi} = factor loadings on the common factor; *v*/*m* = factor loadings on value-specific and moral-focus-specific factors. *s*/*i* = factor loadings on method-specific factors; r_{vs}/r_{vi}/r_{ms}/r_{mi} = residual variance components.

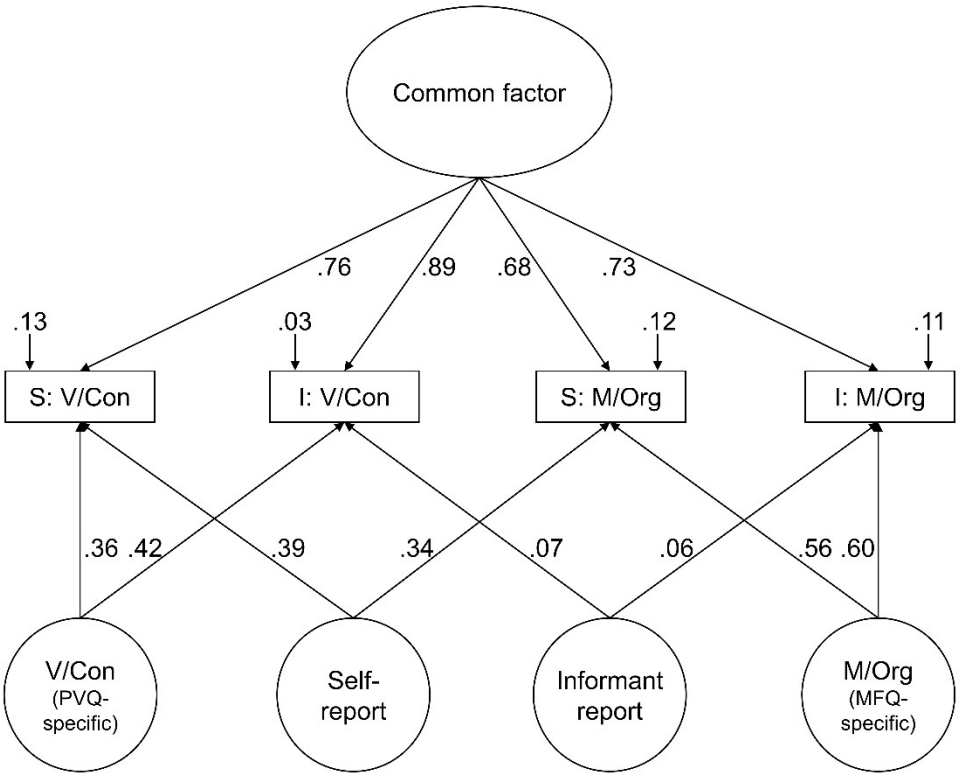

Figure 4. Multitrait-multirater model analysis results of V/Con and M/Org.

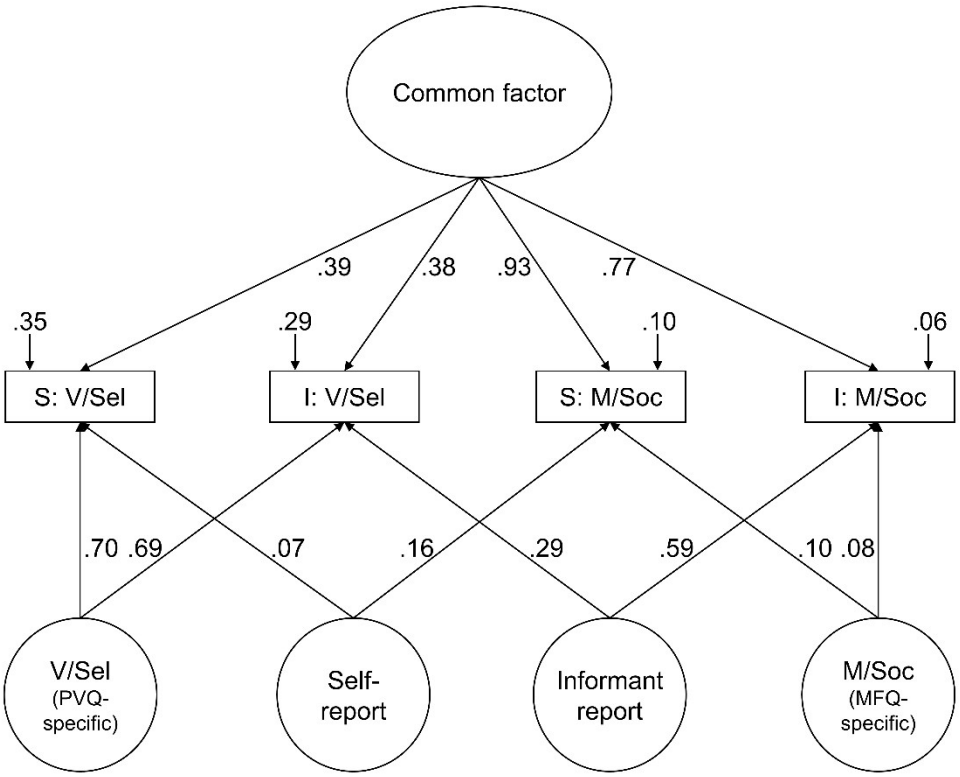

Figure 5. Multitrait-multirater model analysis results of V/Sel and M/Soc.

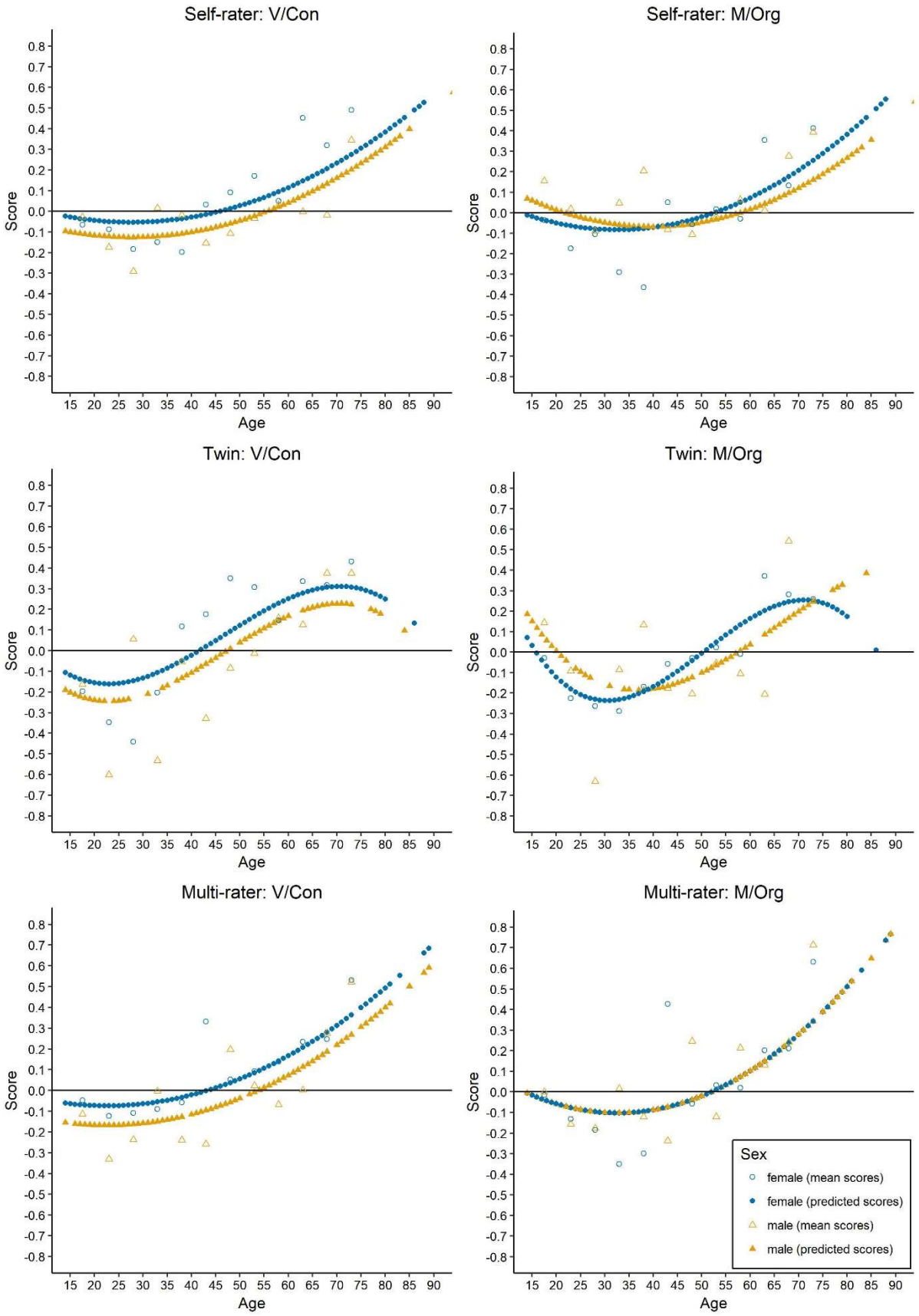
Self-rater: V/Con
Self-rater: M/Org
Twin: V/Con
Twin: M/Org
Multi-rater: V/Con
Multi-rater: M/Org
Score
Age
Sex
female (mean scores)
female (predicted scores)
male (mean scores)
male (predicted scores)

Figure 6. Predicted scores of V/Con and M/Org by age and sexes for the self-rater (upper panel), twin (middle panel), and multi-rater (lower panel) subsample. Predicted scores (filled shapes) are based on the best fitting within-construct regression model, and mean scores (unfilled shapes) of five-year age groups (except for the youngest group, comprising participants between 14 and 20 years of age, and the oldest group, comprising all participants of 71 years of age and older) are shown.

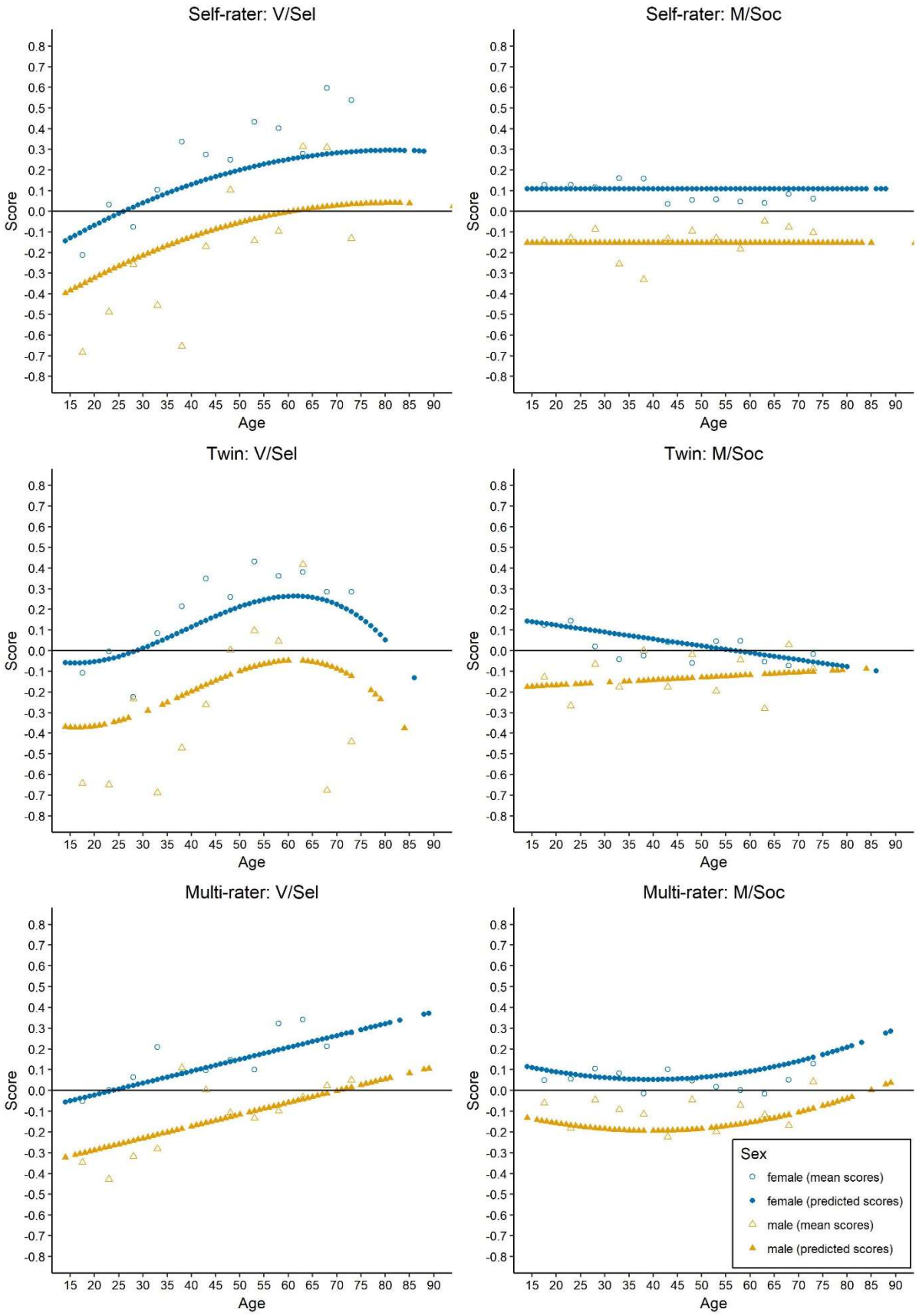
Self-rater: V/Sel
Self-rater: M/Soc
Twin: V/Sel
Twin: M/Soc
Multi-rater: V/Sel
Multi-rater: M/Soc
Score
Age
Sex
female (mean scores)
female (predicted scores)
male (mean scores)
male (predicted scores)

Figure 7. Predicted scores of V/Sel and M/Soc by age and sexes for the self-rater (upper panel), twin (middle panel), and multi-rater (lower panel) subsample. Scores (filled shapes) are based on the best fitting within-construct regression model, and mean scores (unfilled shapes) of five-year age groups (except for the youngest group, comprising participants between 14 and 20 years of age, and the oldest group, comprising all participants of 71 years of age and older) are shown.

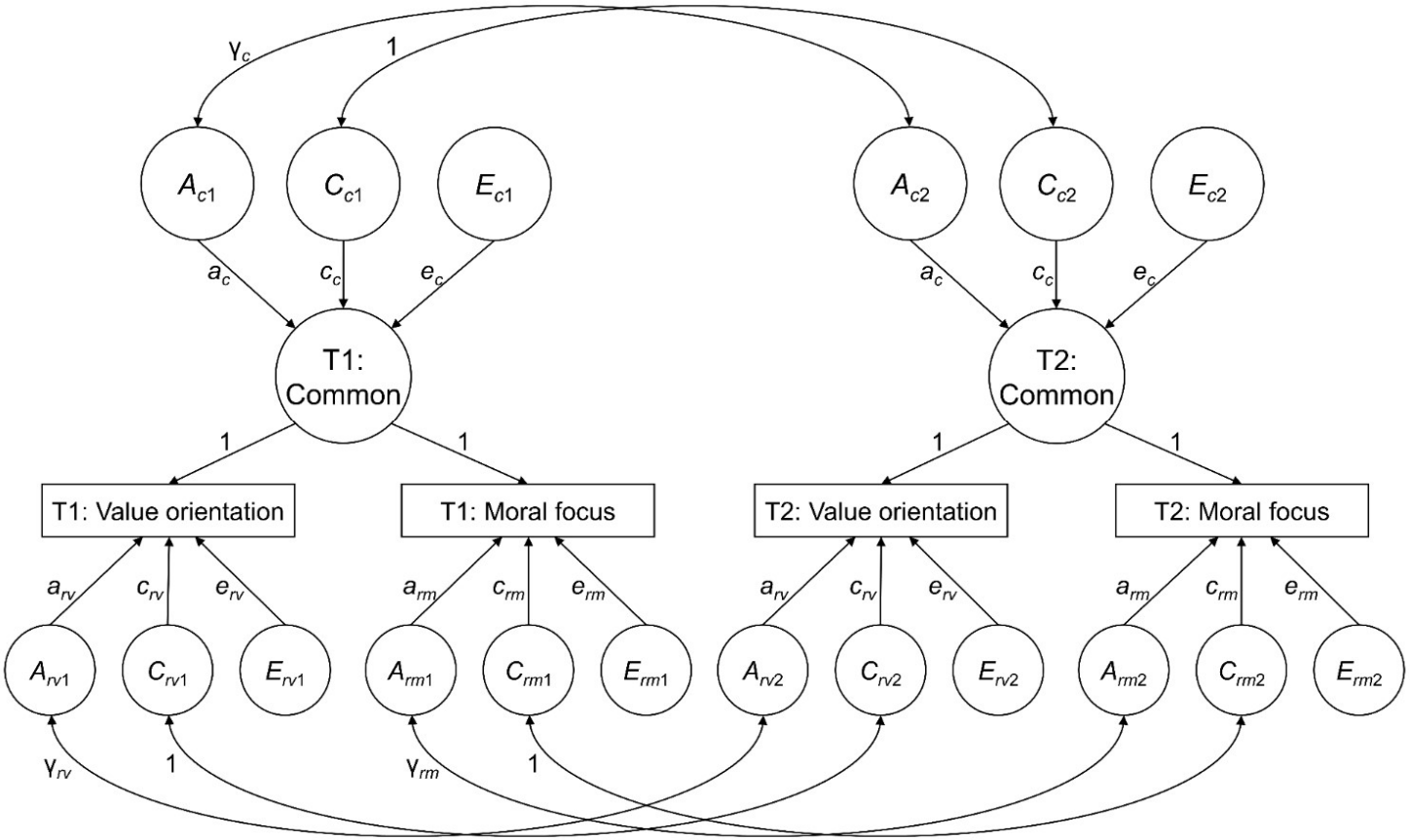

Figure 8. Full bivariate twin model, comprising the reported basic value orientation and focus of moral concern of twin 1 (T1) and twin 2 (T2). This common pathway model includes a common factor contributing to the variance in both dimensions and mediating common genetic and environmental sources. $\gamma_{c/rv/rm}$ = genetic correlation between twins for the common factor/the specific factor of reported value orientation/focus

of moral concern; $A_{c1/2}/C_{c1/2}/E_{c1/2}$ = Additive genetic/shared environmental/nonshared environmental sources of variance in the common factor of twin 1/2; $a_c/c_c/e_c$ = Additive genetic/shared environmental/nonshared environmental effects on the common factor; $A_{rv1/2}/C_{rv1/2}/E_{rv1/2}$ = Additive genetic/shared environmental/nonshared environmental sources of variance specific to the value orientation of twin 1/2; $A_{rm1/2}/C_{rm1/2}/E_{rm1/2}$ = Additive genetic/shared environmental/nonshared environmental sources of variance specific to the focus of moral concern of twin 1/2; $a_{rv}/c_{rv}/e_{rv}$ = Additive genetic/shared environmental/nonshared environmental effects specific to the value orientation; $a_{rm}/c_{rm}/e_{rm}$ = Additive genetic/shared environmental/nonshared environmental effects specific to the focus of moral concern.

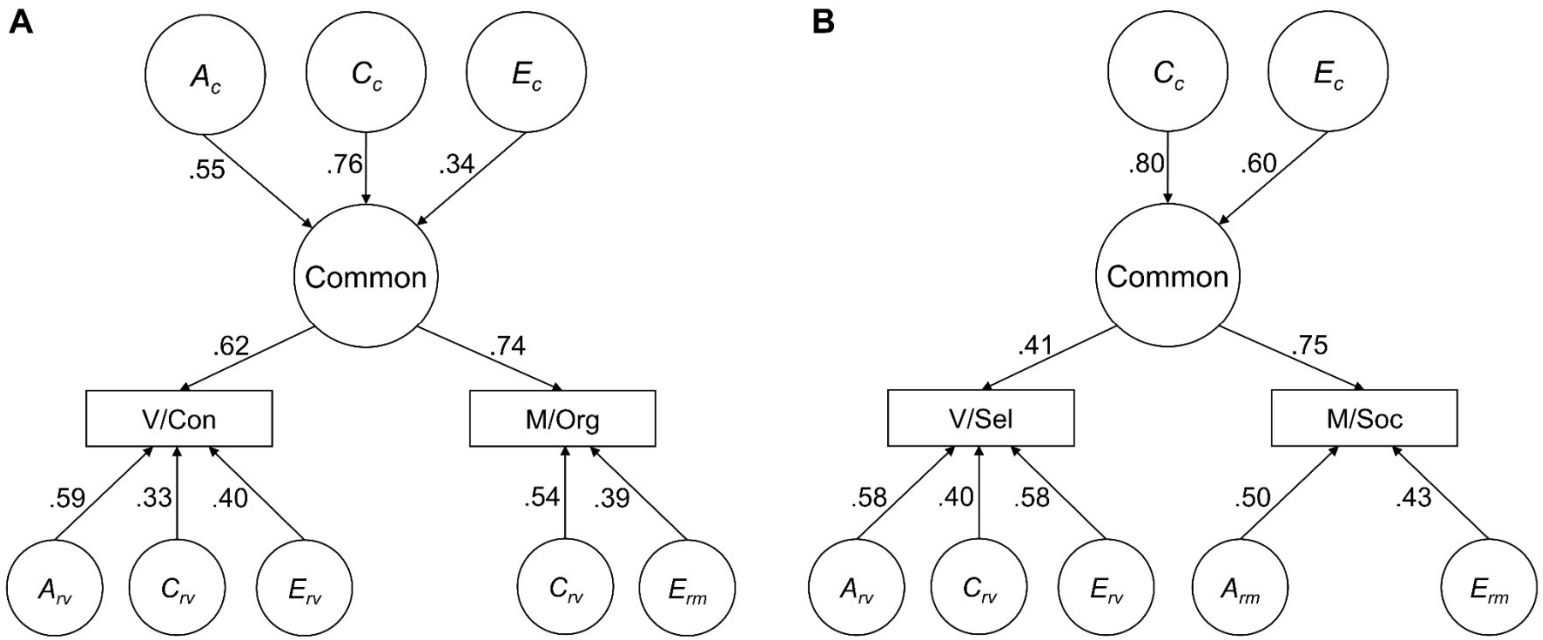

Figure 9. Most parsimonious bivariate ACE models for (A) V/Con and M/Org and (B) V/Sel and M/Soc with standardized parameter estimates.

Supplements A, B, C, and D

Supplement A: Descriptive Statistics

Table A1. *Descriptive Statistics of the Portrait Values Questionnaire within the Self- and Multi-Rater Subsample*

		Self-rater					Multi-rater									
							Target					Informant				
Value	Item	*n*	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt
Benevolence–caring	BEC1	1421	5.45	0.70	**–1.41**	**2.91**	923	5.43	0.75	**–1.40**	**2.14**	924	5.42	0.73	**–1.35**	**2.29**
	BEC2	1420	5.27	0.80	**–1.29**	**2.43**	924	5.28	0.81	**–1.31**	**2.16**	924	5.28	0.87	**–1.52**	**3.02**
	BEC3	1411	4.75	1.07	–0.76	0.23	923	4.78	1.08	–0.78	0.24	922	4.83	1.04	–0.90	0.60
Benevolence–	BED1	1421	5.23	0.82	**–1.37**	**3.37**	924	5.26	0.80	**–1.21**	**2.17**	924	5.21	0.79	**–1.18**	**2.42**
dependability	BED2	1421	5.42	0.73	**–1.65**	**4.70**	924	5.46	0.71	**–1.45**	**2.80**	924	5.34	0.78	**–1.42**	**3.08**
	BED3	1420	5.32	0.81	**–1.50**	**3.53**	921	5.32	0.81	**–1.37**	**2.64**	922	5.25	0.83	**–1.33**	**2.36**
Universalism–concern	UNC1	1421	4.91	0.93	–0.94	**1.08**	924	4.90	0.95	**–1.01**	**1.47**	924	4.84	0.93	–0.84	0.98
	UNC2	1421	4.92	1.02	**–1.02**	0.99	924	5.02	1.01	**–1.15**	**1.28**	924	4.90	0.99	**–1.05**	**1.32**
	UNC3	1413	4.72	1.06	–0.84	0.59	920	4.84	1.05	**–1.11**	**1.42**	923	4.67	1.03	–0.89	0.76
Universalism–nature	UNN1	1420	4.39	1.18	–0.58	–0.20	924	4.41	1.19	–0.55	–0.26	924	4.29	1.16	–0.50	–0.17
	UNN2	1421	3.74	1.34	–0.15	–0.75	924	3.71	1.31	–0.16	–0.84	924	3.56	1.31	–0.02	–0.74
	UNN3	1416	4.49	1.15	–0.65	0.01	921	4.45	1.21	–0.69	–0.05	923	4.27	1.18	–0.64	0.16
Universalism–tolerance	UNT1	1421	5.00	1.00	**–1.20**	**1.65**	924	5.14	0.95	**–1.40**	**2.39**	924	4.93	1.01	**–1.18**	**1.71**
	UNT2	1421	4.72	0.97	–0.80	0.78	924	4.87	0.90	–0.86	**1.31**	924	4.51	1.01	–0.71	0.37
	UNT3	1420	4.86	0.92	–0.86	**1.06**	921	4.92	0.90	–0.89	**1.16**	923	4.63	0.96	–0.80	0.81
Achievement	AC1	1421	4.81	1.03	–0.88	0.68	924	4.82	0.98	–0.80	0.48	924	4.87	0.93	–0.98	**1.24**
	AC2	1420	3.64	1.29	–0.14	–0.75	924	3.61	1.29	–0.11	–0.79	924	3.71	1.24	–0.26	–0.66

	AC3	1416	4.37	1.06	–0.67	0.32	923	4.38	1.07	–0.51	–0.02	921	4.53	0.99	–0.78	0.79
Power–dominance	POD1	1420	3.11	1.25	0.23	–0.70	923	2.99	1.26	0.36	–0.60	924	3.24	1.24	0.18	–0.84
	POD2	1421	2.57	1.20	0.62	–0.23	924	2.54	1.16	0.63	–0.10	924	2.63	1.24	0.56	–0.40
	POD3	1418	2.77	1.23	0.38	–0.56	924	2.70	1.22	0.53	–0.38	923	2.91	1.30	0.35	–0.77
Power–resources	POR1	1421	2.62	1.29	0.60	–0.41	924	2.50	1.29	0.77	–0.13	924	2.63	1.31	0.59	–0.54
	POR2	1421	2.79	1.30	0.38	–0.64	924	2.69	1.31	0.48	–0.57	924	2.85	1.32	0.34	–0.81
	POR3	1416	2.23	1.19	0.91	0.27	923	2.19	1.23	**1.03**	0.46	921	2.34	1.23	0.81	–0.04
FAC	FAC1	1420	4.14	1.21	–0.55	–0.31	922	4.06	1.21	–0.29	–0.73	924	4.15	1.16	–0.41	–0.48
	FAC2	1421	4.06	1.13	–0.43	–0.33	924	4.01	1.15	–0.38	–0.39	924	4.17	1.06	–0.51	–0.20
	FAC3	1415	4.49	1.20	–0.75	0.05	919	4.50	1.20	–0.74	–0.04	918	4.60	1.05	–0.61	0.05
Hedonism	HE1	1421	4.75	1.04	–0.78	0.27	924	4.67	1.10	–0.76	0.12	924	4.76	0.96	–0.82	0.76
	HE2	1421	4.90	0.96	–0.95	**1.05**	924	4.96	0.96	–0.99	**1.06**	924	4.96	0.86	–0.93	**1.58**
	HE3	1417	3.75	1.34	–0.21	–0.73	922	3.72	1.33	–0.22	–0.72	919	3.78	1.28	–0.26	–0.66
Humility	HU1	1421	4.07	1.34	–0.40	–0.75	923	4.12	1.33	–0.47	–0.65	924	4.01	1.26	–0.35	–0.64
	HU2	1421	4.40	1.07	–0.53	–0.08	924	4.29	1.12	–0.54	–0.11	924	4.22	1.11	–0.47	–0.10
	HU3	1415	4.03	1.25	–0.32	–0.58	923	4.00	1.24	–0.31	–0.59	924	4.13	1.17	–0.52	–0.28
Security–personal	SEP1	1420	4.85	0.99	–0.83	0.53	924	4.91	0.98	–0.87	0.47	924	5.04	0.93	**–1.10**	**1.58**
	SEP2	1420	4.90	0.95	**–1.02**	**1.39**	924	4.88	0.98	–0.89	0.68	924	5.03	0.82	**–1.08**	**2.38**
	SEP3	1414	3.81	1.26	–0.15	–0.74	918	3.70	1.26	–0.05	–0.80	922	3.92	1.20	–0.29	–0.65
Security–societal	SES1	1415	4.42	1.18	–0.54	–0.25	922	4.22	1.31	–0.45	–0.66	921	4.38	1.12	–0.73	0.36
	SES2	1420	4.26	1.18	–0.58	–0.14	924	4.13	1.32	–0.45	–0.65	924	4.28	1.14	–0.67	0.16
	SES3	1419	5.04	0.91	**–1.26**	**2.31**	923	4.96	1.00	**–1.07**	**1.03**	924	5.16	0.78	**–1.09**	**2.13**
Tradition	TR1	1420	3.89	1.34	–0.38	–0.65	924	3.57	1.38	–0.04	–0.91	924	3.79	1.30	–0.34	–0.67

	TR2	1420	3.40	1.48	0.01	**–1.00**	923	3.17	1.51	0.21	**–1.05**	924	3.4	1.43	–0.10	**–1.03**
	TR3	1421	3.65	1.36	–0.22	–0.77	924	3.44	1.39	–0.01	–0.93	924	3.62	1.29	–0.30	–0.77
Conformity–rules	COR1	1421	3.92	1.24	–0.39	–0.46	924	3.76	1.31	–0.23	–0.79	924	3.92	1.25	–0.42	–0.59
	COR2	1421	4.09	1.29	–0.62	–0.35	924	3.95	1.37	–0.51	–0.66	924	4.06	1.28	–0.57	–0.46
	COR3	1417	3.97	1.25	–0.40	–0.45	922	3.84	1.3	–0.29	–0.70	918	4.06	1.21	–0.48	–0.36
Conformity–	COI1	1419	4.52	1.16	–0.93	0.53	924	4.53	1.14	–0.82	0.38	924	4.51	1.07	–0.85	0.61
interpersonal	COI2	1420	4.38	1.16	–0.70	0.00	924	4.43	1.17	–0.72	0.05	924	4.23	1.13	–0.52	–0.34
	COI3	1421	3.95	1.23	–0.31	–0.56	920	3.94	1.28	–0.32	–0.63	920	3.71	1.24	–0.23	–0.79
Self-direction–thought	SDT1	1421	4.59	1.07	–0.91	0.66	924	4.71	0.98	–0.76	0.33	924	4.86	0.92	–0.97	**1.39**
	SDT2	1420	5.00	0.92	**–1.10**	**1.66**	924	5.02	0.83	–0.80	0.96	923	5.05	0.83	–0.84	0.98
	SDT3	1421	4.83	0.91	–0.80	0.88	924	4.90	0.85	–0.67	0.46	924	4.79	1.00	–0.86	0.72
Self-direction–action	SDA1	1421	5.11	0.79	–0.91	**1.43**	921	5.15	0.79	**–1.03**	**1.90**	924	5.23	0.73	**–1.09**	**2.71**
	SDA2	1420	4.75	0.93	–0.76	0.66	924	4.85	0.86	–0.66	0.41	924	4.94	0.85	–0.92	**1.69**
	SDA3	1417	5.23	0.79	**–1.08**	**1.82**	923	5.33	0.72	**–1.03**	**1.57**	919	5.29	0.72	**–1.12**	**2.40**
Stimulation	ST1	1419	4.08	1.14	–0.39	–0.42	924	4.19	1.17	–0.48	–0.41	924	4.23	1.11	–0.56	–0.03
	ST2	1421	3.47	1.36	0.04	–0.88	924	3.46	1.38	0.06	–0.95	924	3.25	1.31	0.10	–0.82
	ST3	1410	4.53	1.02	–0.53	–0.13	918	4.63	1.00	–0.69	0.45	920	4.58	1.03	–0.75	0.42

Note. Skew = Skewness; Kurt = Kurtosis. A skewness and kurtosis of ≥ | 1 | are bold-faced.

Table A2. *Descriptive Statistics of the Portrait Values Questionnaire within the Twin Subsample*

		Twin 1					Twin 2				
Value	Item	*n*	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt
Benevolence–caring	BEC1	555	5.55	0.64	**–1.42**	**2.49**	555	5.49	0.71	**–1.69**	**4.66**
	BEC2	554	5.36	0.73	**–1.03**	0.82	555	5.31	0.81	**–1.33**	**2.20**
	BEC3	554	4.87	1.02	–0.80	0.31	553	4.80	1.07	–0.79	0.22
Benevolence–dependability	BED1	555	5.34	0.73	**–1.15**	**2.51**	554	5.28	0.81	**–1.52**	**3.89**
	BED2	555	5.52	0.65	**–1.75**	**6.29**	555	5.47	0.69	**–1.39**	**2.47**
	BED3	554	5.45	0.71	**–1.61**	**4.36**	554	5.44	0.70	**–1.29**	**2.16**
Universalism–concern	UNC1	555	4.94	0.93	**–1.07**	**1.44**	554	4.89	0.99	**–1.01**	**1.06**
	UNC2	555	5.07	0.97	**–1.15**	**1.43**	555	4.98	0.96	**–1.01**	**1.25**
	UNC3	552	4.87	1.05	**–1.03**	0.96	555	4.82	1.03	–0.88	0.72
Universalism–nature	UNN1	555	4.46	1.17	–0.69	0.20	554	4.50	1.18	–0.71	–0.02
	UNN2	555	3.76	1.32	–0.19	–0.74	555	3.75	1.29	–0.17	–0.70
	UNN3	554	4.58	1.15	–0.88	0.59	554	4.56	1.13	–0.74	0.10
Universalism–tolerance	UNT1	555	5.16	0.89	**–1.43**	**3.05**	555	5.08	0.93	**–1.19**	**1.67**
	UNT2	554	4.77	0.96	–0.74	0.39	555	4.77	0.89	–0.74	0.56
	UNT3	554	4.97	0.87	–0.89	**1.25**	555	4.88	0.89	–0.91	**1.41**
Achievement	AC1	554	4.97	1.00	**–1.03**	**1.07**	553	4.92	1.04	**–1.04**	0.87
	AC2	555	3.70	1.33	–0.25	–0.76	555	3.73	1.27	–0.19	–0.62
	AC3	554	4.55	1.08	–0.88	0.89	553	4.58	1.03	–0.82	0.58
Power–dominance	POD1	554	3.05	1.23	0.28	–0.67	552	3.14	1.22	0.27	–0.71
	POD2	555	2.46	1.16	0.68	–0.08	554	2.52	1.15	0.62	–0.16
	POD3	555	2.65	1.21	0.49	–0.35	555	2.71	1.16	0.49	–0.33
Power–resources	POR1	554	2.48	1.29	0.71	–0.19	555	2.55	1.24	0.62	–0.19
	POR2	555	2.69	1.27	0.41	–0.66	555	2.80	1.26	0.39	–0.50
	POR3	554	2.04	1.10	**1.00**	0.49	555	2.17	1.09	0.77	0.10
FAC	FAC1	555	4.19	1.25	–0.46	–0.57	555	4.21	1.18	–0.48	–0.47
	FAC2	555	4.23	1.13	–0.63	0.26	555	4.27	1.13	–0.60	–0.04
	FAC3	554	4.65	1.14	–0.88	0.45	554	4.59	1.10	–0.69	–0.03
Hedonism	HE1	554	4.75	1.13	–0.90	0.30	554	4.77	1.09	–0.77	–0.14
	HE2	555	4.93	1.03	**–1.06**	**1.07**	555	4.91	0.96	–0.87	0.54
	HE3	553	3.77	1.43	–0.20	–0.94	555	3.74	1.34	–0.11	–0.87
Humility	HU1	554	4.02	1.42	–0.38	–0.86	553	4.03	1.38	–0.34	–0.91
	HU2	553	4.47	1.07	–0.56	0.19	554	4.44	1.07	–0.62	0.11
	HU3	554	4.20	1.22	–0.37	–0.56	555	4.16	1.26	–0.43	–0.45

Security–personal	SEP1	554	4.98	1.00	**–1.23**	**1.99**	555	4.99	1.00	**–1.06**	0.99
	SEP2	555	5.02	0.92	**–1.07**	**1.65**	555	4.93	0.92	–0.89	0.85
	SEP3	555	3.94	1.30	–0.22	–0.74	554	3.98	1.28	–0.24	–0.69
Security–societal	SES1	553	4.49	1.17	–0.65	0.03	553	4.48	1.16	–0.59	–0.19
	SES2	555	4.38	1.21	–0.73	0.15	555	4.36	1.17	–0.58	–0.26
	SES3	555	5.14	0.88	**–1.28**	**2.50**	555	5.11	0.84	**–1.19**	**2.30**
Tradition	TR1	554	3.97	1.33	–0.47	–0.57	554	3.96	1.32	–0.33	–0.71
	TR2	555	3.52	1.49	–0.10	**–1.00**	555	3.51	1.42	–0.06	–0.92
	TR3	554	3.75	1.41	–0.31	–0.72	555	3.77	1.32	–0.22	–0.71
Conformity–rules	COR1	555	4.10	1.22	–0.60	–0.25	554	4.14	1.22	–0.52	–0.40
	COR2	555	4.20	1.24	–0.67	–0.13	555	4.20	1.25	–0.65	–0.30
	COR3	553	4.22	1.18	–0.57	–0.27	555	4.15	1.21	–0.50	–0.33
Conformity–interpersonal	COI1	555	4.61	1.17	**–1.06**	0.75	554	4.62	1.13	**–1.00**	0.64
	COI2	554	4.52	1.12	–0.80	0.23	555	4.45	1.14	–0.81	0.20
	COI3	555	4.08	1.23	–0.41	–0.43	555	4.10	1.18	–0.44	–0.35
Self-direction–thought	SDT1	555	4.54	1.15	–0.82	0.25	555	4.47	1.11	–0.73	0.23
	SDT2	555	5.07	0.88	**–1.10**	**1.86**	555	5.00	0.86	–0.80	0.72
	SDT3	554	4.87	0.93	–0.78	0.58	554	4.81	0.91	**–1.02**	**1.59**
Self-direction–action	SDA1	555	5.14	0.81	**–1.23**	**2.53**	555	5.12	0.86	**–1.00**	**1.01**
	SDA2	554	4.76	0.92	–0.74	0.66	555	4.70	0.94	–0.88	0.77
	SDA3	552	5.37	0.67	–0.78	0.24	554	5.29	0.77	**–1.06**	**1.30**
Stimulation	ST1	555	4.02	1.21	–0.40	–0.62	553	4.05	1.17	–0.37	–0.55
	ST2	555	3.31	1.44	0.03	–0.99	555	3.38	1.38	0.09	–0.93
	ST3	554	4.58	1.09	–0.66	0.13	554	4.53	1.06	–0.57	–0.07

Note. Skew = Skewness; Kurt = Kurtosis. A skewness and kurtosis of ≥ | 1 | are bold-faced.

Table A3. *Descriptive Statistics of the short Moral Foundations Questionnaire within the Self- and Multi-Rater Subsample*

								Multi-rater								
Moral		Original Item	Self-rater					Target					Informant				
concern	Item	label	*n*	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt
Care vs.	EMOT	EMOTIONALLY	1420	4.74	0.96	**–1.31**	**2.27**	924	4.77	0.94	**–1.33**	**2.43**	924	4.50	1.06	**–1.02**	0.80
Harm	WEAK	WEAK	1421	4.99	0.86	**–1.19**	**2.58**	924	5.02	0.86	**–1.26**	**2.81**	923	4.72	0.91	–0.86	0.90
	COMP	COMPASSION	1421	4.55	1.00	–0.96	**1.16**	924	4.49	1.02	–0.89	0.94	924	4.36	1.06	–0.84	0.74
	ANIM	ANIMAL	1421	4.90	1.23	**–1.29**	**1.19**	924	4.90	1.19	**–1.22**	**1.08**	924	4.86	1.22	**–1.12**	0.73
Fairness vs.	TREA	TREATED	1421	4.60	1.04	**–1.07**	**1.32**	922	4.69	1.04	**–1.15**	**1.52**	924	4.46	1.03	–0.81	0.41
Cheating	UNFA	UNFAIRLY	1421	5.02	0.86	**–1.41**	**3.51**	924	5.11	0.86	**–1.44**	**3.50**	924	4.92	0.85	**–1.19**	**2.55**
	FAIR	FAIRLY	1421	5.23	0.80	**–1.17**	**1.94**	923	5.24	0.83	**–1.46**	**3.50**	924	5.10	0.86	**–1.24**	**2.31**
	JUST	JUSTICE	1421	5.29	0.76	**–1.17**	**2.37**	924	5.28	0.77	**–1.11**	**1.92**	924	5.14	0.84	–0.96	**1.30**
Loyalty vs.	BETR	BETRAY	1420	4.88	1.00	**–1.33**	**2.41**	924	4.89	1.00	**–1.14**	**1.59**	923	4.66	1.01	–0.96	0.94
Betrayal	LOYA	LOYALTY	1415	4.41	1.06	–0.67	0.24	923	4.31	1.20	–0.64	–0.05	923	4.26	1.14	–0.53	–0.20
	FAMI	FAMILY	1421	4.35	1.28	–0.71	–0.18	923	4.09	1.33	–0.44	–0.62	924	4.35	1.23	–0.64	–0.19
	TEAM	TEAM	1415	4.46	1.08	–0.79	0.41	918	4.42	1.14	–0.75	0.16	923	4.30	1.12	–0.56	–0.19
Authority vs.	RESP	RESPECT	1421	3.82	1.24	–0.37	–0.68	924	3.62	1.32	–0.20	–0.87	923	3.49	1.26	–0.04	–0.83
Subversion	TRAD	TRADITIONS	1420	3.06	1.29	0.24	–0.79	923	2.80	1.29	0.46	–0.67	924	2.87	1.29	0.37	–0.73
	KIDR	KIDRESPECT	1421	4.55	1.12	–0.88	0.69	924	4.35	1.17	–0.58	–0.18	924	4.30	1.20	–0.69	–0.03
	SOLD	SOLDIER	1419	3.32	1.37	0.04	**–1.03**	921	3.12	1.34	0.07	–0.91	923	3.25	1.32	0.07	–0.90
Sanctity vs.	DECE	DECENCY	1420	4.15	1.25	–0.67	–0.15	924	4.05	1.32	–0.53	–0.55	924	3.83	1.32	–0.39	–0.76
Degradation	DISG	DISGUSTING	1415	3.86	1.39	–0.21	–0.90	921	3.71	1.43	–0.07	**–1.08**	922	3.67	1.34	–0.08	–0.88
	HARM	HARMLESSDG	1420	3.33	1.53	0.15	**–1.14**	922	3.04	1.54	0.35	**–1.04**	924	3.42	1.44	0.08	**–1.04**

UNNA	UNNATURAL	1412	3.47	1.36	–0.10	–0.93	921	3.30	1.38	0.09	–0.99	920	3.58	1.29	–0.11	–0.90

Note. Skew = Skewness; Kurt = Kurtosis. A skewness and kurtosis of ≥ | 1 | are bold-faced.

Table A4. *Descriptive Statistics of the short Moral Foundations Questionnaire within the Twin Subsample*

Moral concern	Item	Original Item label	Twin 1					Twin 2				
			n	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt
Care vs.	EMOT	EMOTIONALLY	555	4.86	0.94	**–1.22**	**2.21**	554	4.81	0.99	**–1.52**	**3.04**
Harm	WEAK	WEAK	555	5.09	0.84	**–1.29**	**2.77**	554	5.07	0.86	**–1.26**	**2.75**
	COMP	COMPASSION	555	4.54	1.08	–0.89	0.96	555	4.57	1.01	–0.90	**1.05**
	ANIM	ANIMAL	555	4.99	1.17	**–1.28**	**1.30**	555	4.99	1.20	**–1.38**	**1.65**
Fairness vs.	TREA	TREATED	553	4.65	1.12	**–1.26**	**1.56**	555	4.69	1.01	**–1.09**	**1.48**
Cheating	UNFA	UNFAIRLY	555	5.23	0.79	**–1.40**	**3.46**	554	5.12	0.82	**–1.29**	**3.21**
	FAIR	FAIRLY	555	5.30	0.86	**–1.77**	**4.47**	555	5.31	0.73	**–1.10**	**1.92**
	JUST	JUSTICE	555	5.34	0.80	**–1.40**	**2.84**	555	5.32	0.75	**–1.14**	**1.56**
Loyalty vs.	BETR	BETRAY	554	4.99	0.99	**–1.42**	**2.75**	554	4.94	0.95	**–1.05**	**1.39**
Betrayal	LOYA	LOYALTY	555	4.47	1.06	–0.62	0.21	554	4.40	1.11	–0.57	–0.07
	FAMI	FAMILY	554	4.43	1.26	–0.74	–0.13	555	4.45	1.21	–0.70	–0.14
	TEAM	TEAM	553	4.54	1.13	–0.70	0.15	554	4.57	1.09	–0.88	0.67
Authority	RESP	RESPECT	554	4.01	1.28	–0.57	–0.45	554	3.95	1.23	–0.47	–0.47
vs.	TRAD	TRADITIONS	555	3.09	1.31	0.17	–0.83	554	3.15	1.28	0.25	–0.69
Subversion	KIDR	KIDRESPECT	555	4.73	1.09	**–1.09**	**1.32**	555	4.74	0.99	**–1.04**	**1.46**
	SOLD	SOLDIER	554	3.45	1.33	–0.13	–0.81	555	3.38	1.34	–0.08	–0.91
Sanctity vs.	DECE	DECENCY	555	4.37	1.21	–0.80	0.04	554	4.35	1.19	–0.67	–0.17
Degradation	DISG	DISGUSTING	553	3.89	1.39	–0.18	–0.85	555	3.94	1.42	–0.19	**–1.04**
	HARM	HARMLESSDG	554	3.35	1.58	0.11	**–1.18**	555	3.51	1.50	0.03	**–1.11**
	UNNA	UNNATURAL	550	3.38	1.35	–0.01	–0.97	554	3.50	1.31	–0.04	–0.79

Note. Skew = Skewness; Kurt = Kurtosis. A skewness and kurtosis of ≥ | 1 | are bold-faced.

Table A5. *Descriptive Statistics of the HEXACO Personality Inventory–Revised within the Self- and Multi-Rater Subsample*

							Multi-rater									
		Self-rater					Target					Informant				
Personality trait	Item	*n*	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt
Honesty-humility	Hfair1R	1420	3.65	1.41	–0.64	–0.98	924	3.61	1.42	–0.58	**–1.06**	924	3.79	1.26	–0.70	–0.71
	Hfair6	1421	3.71	1.26	0.71	–0.57	924	3.71	1.23	–0.68	–0.56	924	3.82	1.21	–0.85	–0.27
	Hfair8R	1421	3.86	1.27	–0.78	–0.68	924	3.80	1.28	–0.76	–0.67	924	4.02	1.13	–0.95	–0.15
	Hgree2	1421	3.14	0.99	0.05	–0.61	924	3.13	1.00	–0.05	–0.65	924	3.34	1.04	–0.29	–0.56
	Hgree7R	1420	3.35	1.13	–0.22	–0.86	924	3.35	1.18	–0.22	–0.90	924	3.39	1.20	–0.30	–0.95
	Hmode6R	1421	3.69	0.96	–0.30	–0.48	924	3.83	0.96	–0.49	–0.38	924	3.66	0.95	–0.45	–0.31
	Hmode8R	1421	3.75	0.97	–0.49	–0.35	924	3.76	1.00	–0.57	–0.29	924	3.76	1.03	–0.62	–0.34
	Hsinc4	1420	3.32	1.23	0.20	**–1.04**	924	3.31	1.25	–0.18	**–1.11**	924	3.55	1.15	–0.47	–0.70
	Hsinc5R	1421	3.79	1.03	–0.68	–0.19	924	3.82	1.01	–0.69	–0.25	924	3.82	1.03	–0.68	–0.27
	Hsinc6	1421	3.68	1.17	0.66	–0.53	922	3.66	1.19	–0.64	–0.57	924	3.82	1.07	–0.82	–0.07
	M. score	1421	3.59	0.64	–0.33	–0.13	924	3.60	0.62	–0.46	0.13	924	3.70	0.63	–0.51	0.25
Emotionality	Eanxi1	1421	3.42	1.23	0.46	–0.82	924	3.48	1.25	–0.50	–0.83	924	3.31	1.17	–0.28	–0.83
	Eanxi4R	1421	3.32	1.10	–0.25	–0.74	924	3.36	1.12	–0.32	–0.75	924	3.39	1.07	–0.38	–0.53
	Edepe3	1421	3.37	1.12	0.33	–0.75	924	3.44	1.11	–0.37	–0.75	924	3.71	1.02	–0.64	–0.19
	Edepe6R	1421	2.72	1.02	0.24	–0.79	924	2.80	1.07	0.15	–0.95	924	2.75	1.06	0.21	–0.88
	Efear1	1419	2.11	1.08	0.72	–0.41	924	2.12	1.09	0.79	–0.25	924	2.34	1.18	0.56	–0.71
	Efear7	1421	2.89	1.11	0.14	–0.88	923	2.90	1.14	0.13	–0.91	924	2.73	1.12	0.26	–0.79

	Efear8R	1420	2.99	1.05	–0.02	–0.76	924	3.02	1.07	–0.05	–0.82	924	2.87	1.09	0.07	–0.85
	Esent1	1421	3.25	1.14	0.34	–0.70	924	3.29	1.15	–0.35	–0.73	921	3.14	1.20	–0.21	–0.93
	Esent3	1421	3.79	0.97	0.73	0.18	924	3.78	0.96	–0.74	0.25	924	3.78	0.99	–0.65	–0.10
	Esent7R	1420	3.84	1.01	–0.69	–0.19	924	3.88	0.99	–0.79	0.07	924	3.93	1.02	–0.86	0.09
	M. score	1420	3.17	0.60	0.08	–0.13	924	3.21	0.62	–0.12	–0.18	924	3.19	0.65	0.01	–0.28
Extraversion	Xlive3	1421	3.77	0.89	0.65	0.23	923	3.79	0.92	–0.61	0.02	924	3.81	0.92	–0.64	0.08
	Xlive7R	1421	3.08	0.98	–0.05	–0.73	924	3.13	1.01	–0.12	–0.75	924	3.15	1.04	–0.15	–0.79
	Xsocb2R	1421	3.66	1.06	–0.62	–0.32	924	3.66	1.09	–0.62	–0.42	924	3.82	1.06	–0.76	–0.20
	Xsocb3	1420	3.40	0.97	0.38	–0.26	924	3.39	0.96	–0.40	–0.23	924	3.40	1.10	–0.38	–0.65
	Xsocb4	1421	2.93	1.04	0.04	–0.61	924	2.95	1.05	–0.04	–0.61	924	2.98	1.09	–0.02	–0.70
	Xsoci5	1421	3.64	1.12	0.48	–0.67	924	3.66	1.12	–0.58	–0.41	924	3.70	1.21	–0.69	–0.55
	Xsoci6	1420	3.16	0.93	0.15	–0.35	924	3.21	0.96	–0.25	–0.37	924	3.24	1.02	–0.28	–0.54
	Xsses1	1420	3.89	0.89	0.83	0.65	923	3.89	0.88	–0.83	0.51	924	3.81	0.92	–0.75	0.18
	Xsses5R	1421	3.80	0.96	–0.70	0.14	924	3.78	0.97	–0.63	–0.09	924	3.82	0.97	–0.64	–0.12
	Xsses8R	1421	3.92	1.14	–0.83	–0.33	923	3.86	1.20	–0.79	–0.51	923	3.66	1.18	–0.52	–0.83
	M. score	1420	3.52	0.59	–0.61	0.53	924	3.53	0.61	–0.56	0.23	924	3.54	0.64	–0.60	0.44
Agreeableness	Aflex1R	1420	2.99	1.24	0.12	**–1.03**	924	2.93	1.17	0.16	–0.97	924	2.92	1.22	0.17	**–1.02**
	Aflex5	1421	2.80	0.96	0.07	–0.68	924	2.79	0.97	0.09	–0.70	924	2.65	1.02	0.22	–0.80
	Aflex7R	1421	3.53	0.97	–0.36	–0.55	924	3.51	1.01	–0.38	–0.61	924	3.40	1.11	–0.36	–0.69
	Aforg1	1421	2.68	1.11	0.27	–0.88	924	2.68	1.12	0.27	–0.95	924	2.78	1.13	0.22	–0.88

	Aforg3	1420	2.69	1.04	0.22	–0.68	923	2.67	1.03	0.19	–0.71	924	2.79	0.98	0.16	–0.53
	Agent4R	1421	3.11	1.13	0.02	–0.85	924	3.10	1.16	–0.07	–0.92	923	3.18	1.15	–0.06	–0.92
	Agent6	1420	3.36	0.90	0.47	–0.26	924	3.39	0.94	–0.52	–0.33	924	3.23	0.99	–0.24	–0.65
	Agent7	1421	2.96	0.95	0.15	–0.87	924	2.94	0.95	0.04	–0.93	924	3.03	1.01	–0.05	–0.92
	Apati2R	1420	4.23	0.97	**–1.07**	0.30	924	4.31	0.97	**–1.31**	0.89	924	4.33	0.99	**–1.45**	**1.37**
	Apati4	1420	3.29	0.95	0.14	–0.48	924	3.32	1.00	–0.16	–0.54	924	3.35	1.04	–0.35	–0.63
	M. score	1421	3.16	0.54	–0.18	0.03	924	3.16	0.56	–0.13	–0.25	924	3.16	0.66	–0.20	–0.11
Conscientiousness	Cdili2	1421	3.63	0.92	0.30	–0.45	924	3.66	0.96	–0.42	–0.34	924	3.83	0.93	–0.57	–0.19
	Cdili6R	1420	3.95	0.97	–0.91	0.36	923	3.90	0.95	–0.79	0.18	924	3.99	1.08	**–1.04**	0.38
	Corga3	1421	3.72	1.12	0.71	–0.29	924	3.77	1.13	–0.71	–0.42	924	3.64	1.24	–0.57	–0.80
	Corga8R	1421	3.81	1.03	–0.74	–0.17	924	3.81	1.08	–0.69	–0.51	924	3.86	1.10	–0.80	–0.24
	Cperf2R	1421	3.62	1.01	–0.54	–0.42	923	3.66	1.00	–0.65	–0.28	924	3.54	1.03	–0.50	–0.55
	Cperf3	1421	3.81	0.90	0.65	0.06	924	3.77	0.95	–0.68	0.02	923	3.85	0.99	–0.70	–0.11
	Cperf4	1421	2.95	1.16	0.11	–0.92	923	3.02	1.23	–0.03	**–1.09**	924	2.92	1.16	0.11	–0.90
	Cprud2R	1421	3.16	1.06	–0.22	–0.76	923	3.22	1.09	–0.28	–0.70	924	3.30	1.09	–0.36	–0.69
	Cprud3R	1421	3.76	0.98	–0.60	–0.25	924	3.79	0.96	–0.64	–0.08	923	4.10	0.97	**–1.01**	0.46
	Cprud8R	1421	3.18	1.03	–0.24	–0.71	923	3.18	0.99	–0.32	–0.54	924	3.33	1.06	–0.39	–0.64
	M. score	1421	3.56	0.58	–0.30	–0.10	924	3.58	0.59	–0.33	–0.03	924	3.64	0.69	–0.48	–0.19
Openness to	Oaesa1R	1421	3.21	1.27	–0.22	**–1.00**	924	3.30	1.21	–0.31	–0.84	924	3.28	1.26	–0.30	–0.99
experience	Oaesa4	1421	3.21	1.34	0.25	**–1.15**	924	3.36	1.27	–0.39	–0.93	924	3.08	1.34	–0.13	**–1.20**

Ocrea6	1421	3.50	1.26	0.53	–0.80	924	3.67	1.21	–0.62	–0.67	923	3.33	1.28	–0.38	–0.98
Ocrea7	1421	3.62	0.93	0.25	–0.39	923	3.65	0.95	–0.39	–0.28	924	3.54	0.93	–0.18	–0.26
Ocrea8R	1421	3.12	1.23	–0.12	**–1.07**	923	3.18	1.24	–0.13	**–1.06**	924	3.08	1.21	0.00	**–1.06**
Oinqu1	1421	3.77	1.03	0.65	–0.12	923	3.77	1.07	–0.67	–0.22	924	3.70	1.17	–0.65	–0.46
Oinqu8R	1421	3.24	1.20	–0.19	–0.94	924	3.33	1.19	–0.32	–0.87	924	3.27	1.14	–0.19	–0.79
Ounco2R	1420	2.94	1.15	–0.08	–0.85	922	2.99	1.13	–0.16	–0.77	924	2.78	1.05	0.14	–0.67
Ounco5	1421	3.90	0.81	0.42	0.02	924	3.97	0.74	–0.42	0.25	924	3.64	0.87	–0.40	0.03
Ounco8R	1421	3.37	1.24	–0.41	–0.84	924	3.54	1.24	–0.53	–0.76	924	3.31	1.20	–0.26	–0.90
M. score	1421	3.39	0.62	–0.15	–0.42	924	3.47	0.61	–0.30	–0.12	924	3.30	0.65	–0.28	–0.27

Note. Skew = Skewness; Kurt = Kurtosis; M. score = Mean score. A skewness and kurtosis of ≥ | 1 | are bold-faced.

Table A6. *Descriptive Statistics of the HEXACO Personality Inventory–Revised within the Twin Subsample*

Personality trait	Item	Twin 1					Twin 2				
		n	*M*	*SD*	Skew	Kurt	*n*	*M*	*SD*	Skew	Kurt
Honesty–humility	Hfair1R	555	3.80	1.40	–0.79	–0.79	553	3.87	1.34	–0.90	–0.50
	Hfair6	553	3.82	1.29	–0.84	–0.48	554	3.87	1.21	–0.94	–0.09
	Hfair8R	552	4.08	1.15	**–1.04**	–0.04	553	4.02	1.16	–0.92	–0.33
	Hgree2	555	3.12	0.98	–0.01	–0.58	554	3.12	0.93	0.03	–0.42
	Hgree7R	551	3.43	1.13	–0.25	–0.87	553	3.40	1.13	–0.25	–0.86
	Hmode6R	555	3.77	0.98	–0.47	–0.42	553	3.78	0.92	–0.38	–0.48
	Hmode8R	553	3.83	0.98	–0.61	–0.20	554	3.76	0.97	–0.62	–0.11
	Hsinc4	555	3.29	1.21	–0.13	**–1.01**	554	3.25	1.18	–0.10	**–1.00**
	Hsinc5R	555	3.78	1.02	–0.69	–0.17	553	3.82	1.00	–0.70	–0.15
	Hsinc6	554	3.70	1.20	–0.77	–0.32	554	3.66	1.18	–0.72	–0.42
	M. score	552	3.66	0.61	–0.53	0.29	553	3.66	0.58	–0.22	–0.37
Emotionality	Eanxi1	554	3.58	1.21	–0.66	–0.56	554	3.59	1.18	–0.63	–0.58
	Eanxi4R	555	3.50	1.06	–0.34	–0.75	554	3.46	1.05	–0.37	–0.62
	Edepe3	554	3.46	1.11	–0.33	–0.80	554	3.44	1.08	–0.34	–0.74
	Edepe6R	553	2.70	1.05	0.18	–0.97	553	2.77	1.03	0.22	–0.84
	Efear1	555	2.17	1.17	0.71	–0.58	554	2.18	1.11	0.70	–0.43
	Efear7	554	2.98	1.19	0.06	**–1.04**	553	2.86	1.15	0.21	–0.87
	Efear8R	554	3.04	1.07	–0.04	–0.84	554	3.04	1.04	0.01	–0.70
	Esent1	555	3.33	1.19	–0.45	–0.69	554	3.29	1.16	–0.40	–0.71
	Esent3	555	3.76	0.97	–0.67	0.01	554	3.74	1.01	–0.66	–0.22
	Esent7R	553	3.90	1.00	–0.79	–0.08	554	3.91	1.04	–0.83	0.00
	M. score	554	3.24	0.63	–0.04	–0.43	554	3.23	0.63	0.01	–0.36
Extraversion	Xlive3	555	3.80	0.93	–0.76	0.48	554	3.77	0.90	–0.77	0.57
	Xlive7R	553	3.22	0.99	–0.11	–0.71	552	3.12	0.99	–0.13	–0.80
	Xsocb2R	555	3.67	1.11	–0.66	–0.37	553	3.58	1.11	–0.58	–0.45
	Xsocb3	555	3.41	1.02	–0.33	–0.40	554	3.39	1.01	–0.41	–0.39
	Xsocb4	555	2.91	1.08	–0.03	–0.71	554	2.78	1.04	0.05	–0.64
	Xsoci5	555	3.66	1.11	–0.52	–0.58	554	3.63	1.06	–0.45	–0.57

	Xsoci6	555	3.15	0.97	–0.17	–0.47	553	3.16	0.93	–0.15	–0.39
	Xsses1	554	3.94	0.94	**–1.05**	0.99	554	3.90	0.84	–0.79	0.65
	Xsses5R	555	3.84	1.01	–0.77	0.13	554	3.90	0.96	–0.89	0.65
	Xsses8R	555	3.95	1.19	–0.92	–0.27	554	3.85	1.22	–0.74	–0.64
	M. score	555	3.55	0.62	–0.77	0.90	554	3.51	0.61	–0.67	0.47
Agreeableness	Aflex1R	555	3.06	1.27	0.01	**–1.08**	553	3.15	1.17	–0.02	–0.96
	Aflex5	555	2.85	0.96	0.16	–0.65	554	2.89	0.92	0.03	–0.76
	Aflex7R	555	3.54	1.06	–0.51	–0.49	554	3.58	1.02	–0.45	–0.58
	Aforg1	555	2.58	1.12	0.38	–0.83	554	2.60	1.09	0.40	–0.70
	Aforg3	555	2.61	1.07	0.37	–0.60	554	2.63	1.00	0.34	–0.51
	Agent4R	554	3.08	1.13	0.04	–0.78	553	3.23	1.09	–0.10	–0.85
	Agent6	554	3.34	0.93	–0.38	–0.42	554	3.36	0.91	–0.46	–0.32
	Agent7	554	2.94	0.96	0.11	–0.83	553	3.02	0.94	0.03	–0.98
	Apati2R	555	4.27	0.96	**–1.12**	0.27	554	4.25	0.96	**–1.16**	0.62
	Apati4	554	3.25	0.92	–0.29	–0.42	554	3.27	0.94	–0.25	–0.44
	M. score	554	3.15	0.57	–0.17	–0.07	553	3.20	0.54	–0.35	0.37
Conscientious	Cdili2	555	3.59	0.92	–0.44	–0.23	553	3.59	0.94	–0.45	–0.26
ness	Cdili6R	553	3.96	1.01	–0.98	0.47	553	3.98	1.00	–0.91	0.17
	Corga3	555	3.84	1.08	–0.79	–0.10	554	3.83	1.06	–0.75	–0.17
	Corga8R	555	3.91	0.99	–0.88	0.15	554	3.87	1.01	–0.75	–0.22
	Cperf2R	555	3.71	0.96	–0.56	–0.38	554	3.69	0.96	–0.66	–0.13
	Cperf3	555	3.90	0.93	–0.70	0.04	554	3.93	0.88	–0.66	0.06
	Cperf4	553	3.02	1.25	–0.04	**–1.06**	553	2.94	1.14	0.18	–0.86
	Cprud2R	555	3.28	1.03	–0.19	–0.68	554	3.20	1.04	–0.15	–0.79
	Cprud3R	554	3.85	1.00	–0.74	0.00	553	3.81	0.97	–0.73	0.09
	Cprud8R	552	3.26	0.98	–0.25	–0.68	554	3.29	0.96	–0.34	–0.51
	M. score	553	3.63	0.57	–0.19	–0.44	554	3.61	0.55	–0.30	0.04
Openness to	Oaesa1R	555	3.12	1.25	–0.12	–0.99	554	3.18	1.24	–0.19	–0.99
experience	Oaesa4	555	3.17	1.39	–0.19	**–1.28**	554	3.19	1.35	–0.25	**–1.17**
	Ocrea6	554	3.48	1.31	–0.45	–0.97	554	3.45	1.30	–0.50	–0.90
	Ocrea7	555	3.67	0.98	–0.49	–0.21	553	3.57	0.96	–0.41	–0.17
	Ocrea8R	553	3.15	1.28	–0.14	**–1.18**	553	3.19	1.23	–0.18	**–1.05**

Oinqu1	555	3.74	1.06	–0.78	0.17	554	3.68	1.02	–0.61	–0.07
Oinqu8R	552	3.12	1.17	–0.09	–0.86	553	3.13	1.17	–0.16	–0.90
Ounco2R	554	2.76	1.11	0.01	–0.82	554	2.82	1.13	–0.03	–0.85
Ounco5	553	3.80	0.77	–0.38	0.25	554	3.75	0.75	–0.23	–0.09
Ounco8R	552	3.35	1.23	–0.32	–0.90	553	3.34	1.21	–0.32	–0.91
M. score	552	3.34	0.61	–0.06	–0.49	554	3.33	0.61	–0.19	–0.37

Note. Skew = Skewness; Kurt = Kurtosis; M. score = Mean score. A skewness and kurtosis of ≥ | 1 | are bold-faced.

Supplement B: Confirmatory Factor Analyses and HEXACO Latent Trait Model

Table B1. *Model Fit Indices of Hierarchical Confirmatory Factor Analyses of Personal Value Orientations and Moral Foci for all Subsamples*

	Personal Value Orientations					Moral Foci				
Subsample	*n*	χ^2	*df*	RMSEA [90% CI]	SRMR	*n*	χ^2	*df*	RMSEA [90% CI]	SRMR
Self-rater										
Free[1]	1421	6262.74	1460	.048 [.047, .049]	.060	1421	824.28	147	.057 [.053, .060]	.051
Free[2]	2900	14016.68	4380	.049 [.048, .050]	.064	2900	1887.89	441	.059 [.056, .062]	.052
Fixed[2]	2900	14209.99	4608	.048 [.047, .049]	.067	2900	1860.35	511	.053 [.051, .055]	.055
Multi-rater										
Free	924	15206.28	6167	.040 [.039, .041]	.070	924	2107.45	688	.047 [.045, .049]	.054
Fixed	924	15297.69	6225	.040 [.039, .040]	.070	924	2116.34	705	.047 [.044, .049]	.055
Twin										
Free	555	11771.87	6166	.040 [.039, .042]	.063	555	1561.14	686	.048 [.045, .051]	.057
Fixed	555	11869.54	6280	.040 [.039, .041]	.064	555	1565.38	722	.046 [.043, .049]	.058

Note. All χ^2 tests were significant ($p < .001$). Shown are scaling-corrected χ^2 test statistics. RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; RMSEA's of baseline models for personal value orientations: Self-rater: RMSEA = .126; Multi-rater: RMSEA = .094; Twin: RMSEA = .090; RMSEA's of baseline models for moral focus factors: Self-rater: RMSEA = .165; Multi-rater: RMSEA = .124; Twin: RMSEA = .113.

[1]Estimated as single group.

[2]Estimated in multi group analysis (self-ratings from the self-rater and multi-rater subsamples and from twin 1 of the twin subsample).

Table B2. *Parameter Estimates of Hierarchical Confirmatory Factor Analyses of Personal Value Orientations for all Subsamples*

			Multi-rater			Twin		
		Self-rater	Fixed	Target	Informant	Fixed	Twin 1	Twin 2
Factor	Item	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)
Benevolence–	BEC1	1	1	.94 (.09)	1	1	1	.97 (.12)
caring (BEC)	BEC2	.91 (.07)	.88 (.05)	1	.78 (.05)	.86 (.08)	.76 (.08)	1
	BEC3	.88 (.09)	.97 (.05)	.92 (.10)	.95 (.07)	.93 (.09)	.96 (.11)	.86 (.15)
V/Sel→BEC		**.20 (.03)**	**.27 (.04)**	**.24 (.05)**	**.32 (.05)**	**.23 (.04)**	**.18 (.05)**	**.30 (.06)**
Benevolence–	BED1	.79 (.12)	.76 (.08)	.76 (.10)	.75 (.11)	.89 (.10)	.90 (.12)	.85 (.15)
dependability	BED2	.77 (.13)	.84 (.09)	.86 (.12)	.84 (.12)	.93 (.10)	.87 (.12)	1
(BED)	BED3	1	1	1	1	1	1	.96 (.16)
V/Sel→BED		**.21 (.03)**	**.22 (.04)**	**.20 (.04)**	**.25 (.05)**	**.20 (.04)**	**.17 (.05)**	**.25 (.06)**
Universalism–	UNC1	.70 (.06)	.74 (.04)	.74 (.06)	.74 (.06)	.70 (.08)	.69 (.13)	.72 (.08)
concern (UNC)	UNC2	.82 (.05)	.84 (.04)	.80 (.06)	.88 (.05)	.81 (.06)	.76 (.08)	.85 (.07)
	UNC3	1	1	1	1	1	1	1
V/Sel→UNC		**.45 (.04)**	**.46 (.04)**	**.47 (.06)**	**.45 (.06)**	**.40 (.06)**	**.37 (.08)**	**.47 (.07)**
Universalism–	UNN1	.89 (.03)	.90 (.02)	.88 (.03)	.93 (.04)	.86 (.04)	.84 (.05)	.89 (.05)
nature (UNN)	UNN2	1	1	1	1	1	1	1
	UNN3	.79 (.03)	.89 (.03)	.89 (.03)	.90 (.04)	.81 (.03)	.83 (.04)	.79 (.05)
V/Sel→UNN		**.34 (.04)**	**.40 (.04)**	**.42 (.06)**	**.39 (.05)**	**.37 (.06)**	**.33 (.07)**	**.43 (.08)**
Universalism–	UNT1	1	.86 (.06)	.84 (.09)	.88 (.07)	.88 (.09)	.87 (.14)	.87 (.10)
tolerance (UNT)	UNT2	.94 (.07)	1	1	1	1	1	1
	UNT3	.82 (.08)	.90 (.06)	.88 (.08)	.91 (.07)	.79 (.10)	.74 (.14)	.83 (.13)

V/Sel→UNT		**.35 (.04)**	**.39 (.04)**	**.39 (.05)**	**.41 (.06)**	**.34 (.05)**	**.36 (.08)**	**.35 (.06)**
Achievement	AC1	.45 (.03)	.43 (.03)	.41 (.04)	.45 (.03)	.46 (.04)	.43 (.05)	.47 (.06)
(AC)	AC2	1	1	1	1	1	1	1
	AC3	.38 (.04)	.38 (.04)	.33 (.05)	.43 (.05)	.35 (.05)	.41 (.06)	.28 (.07)
V/Sel→AC		**–.92 (.04)**	**–.82 (.04)**	**–.81 (.05)**	**–.85 (.05)**	**–.83 (.06)**	**–.82 (.07)**	**–.83 (.07)**
Power–	POD1	1	.73 (.03)	.69 (.05)	.74 (.04)	.70 (.05)	.63 (.06)	.76 (.07)
dominance	POD2	.96 (.04)	.99 (.03)	1	.96 (.04)	1	1	.99 (.07)
(POD)	POD3	.71 (.04)	1	.97 (.05)	1	.96 (.05)	.91 (.06)	1
V/Sel→POD		**–.82 (.04)**	**–.79 (.04)**	**–.77 (.05)**	**–.85 (.05)**	**–.81 (.04)**	**–.80 (.05)**	**–.81 (.06)**
Power–	POR1	.98 (.03)	.98 (.02)	.97 (.03)	1.00 (.04)	1	1	1
resources (POR)	POR2	1	1	1	1	.98 (.04)	.97 (.04)	.99 (.05)
	POR3	.87 (.03)	.89 (.03)	.90 (.03)	.89 (.04)	.82 (.04)	.78 (.05)	.86 (.05)
V/Sel→POR		**–1**	**–1**	**–1**	**–1**	**–1**	**–1**	**–1**
FAC (FAC)	FAC1	.97 (.05)	1	1	1	1	1	.88 (.11)
	FAC2	.58 (.09)	.54 (.07)	.50 (.09)	.59 (.12)	.56 (.08)	.46 (.09)	.63 (.12)
	FAC3	1	.95 (.05)	1.00 (.07)	.90 (.06)	.99 (.07)	.88 (.08)	1
V/Sel→FAC		**–.17 (.04)**	**.46 (.05)**	**–.1.00 (.05)**	**–.26 (.06)**	**–.17 (.04)**	**–.19 (.06)**	**–.16 (.06)**
V/Con→FAC		**.52 (.05)**	**–.18 (.04)**	**–.1.00 (.05)**	**–.26 (.06)**	**.56 (.06)**	**.61 (.09)**	**.58 (.07)**
Hedonism (HE)	HE1	.77 (.05)	.82 (.04)	.86 (.06)	.80 (.05)	.75 (.05)	.69 (.06)	.88 (.10)
	HE2	.50 (.04)	.55 (.03)	.51 (.05)	.58 (.04)	.49 (.04)	.44 (.05)	.57 (.07)
	HE3	1	1	1	1	1	1	1
V/Sel→HE		**–.20 (.04)**	**–.16 (.04)**	**–.22 (.05)**	**–.09 (.05)**	**–.31 (.06)**	**–.34 (.08)**	**–.25 (.08)**
V/Con→HE		**–.12 (.06)**	**–.35 (.06)**	**–.29 (.07)**	**–.41 (.07)**	**–.33 (.11)**	**–.51 (.14)**	**–.19 (.11)**

Humility (HU)	HU1	.42 (.07)	.48 (.06)	.46 (.08)	.49 (.08)	.51 (.11)	.61 (.16)	.43 (.13)
	HU2	.73 (.06)	.91 (.05)	.85 (.06)	.96 (.07)	.79 (.09)	.83 (.13)	.78 (.12)
	HU3	1	1	1	1	1	1	1
V/Sel→HU		**.46 (.03)**	**.55 (.03)**	**.57 (.05)**	**.53 (.04)**	**.43 (.05)**	**.41 (.06)**	**.46 (.08)**
V/Con→HU		**.56 (.05)**	**.46 (.04)**	**.57 (.05)**	**.53 (.04)**	**.39 (.06)**	**.32 (.08)**	**.45 (.08)**
Security–	SEP1	.30 (.04)	.25 (.04)	.29 (.05)	.19 (.06)	.35 (.05)	.39 (.07)	.31 (.05)
personal (SEP)	SEP2	.44 (.04)	.44 (.04)	.46 (.05)	.41 (.05)	.50 (.05)	.51 (.07)	.49 (.06)
	SEP3	1	1	1	1	1	1	1
V/Con→SEP		**1**	**.97 (.06)**	**1**	**.92 (.07)**	**1**	**1**	**1**
Security–	SES1	.47 (.04)	.43 (.03)	.50 (.04)	.35 (.04)	.45 (.05)	.55 (.09)	.39 (.06)
societal (SES)	SES2	.89 (.05)	.96 (.04)	.96 (.04)	.96 (.07)	.89 (.06)	.96 (.10)	.83 (.07)
	SES3	1	1	1	1	1	1	1
V/Con→SES		**.71 (.06)**	**.68 (.06)**	**.78 (.06)**	**.57 (.07)**	**.64 (.07)**	**.63 (.10)**	**.64 (.08)**
Tradition (TR)	TR1	.83 (.03)	.90 (.03)	.84 (.09)	.92 (.04)	.89 (.04)	.89 (.05)	.89 (.05)
	TR2	1	1	1	1	1	1	1
	TR3	.92 (.03)	.95 (.03)	.88 (.08)	.93 (.04)	.98 (.04)	.99 (.06)	.98 (.04)
V/Con→TR		**.78 (.06)**	**.86 (.05)**	**.88 (.08)**	**.83 (.07)**	**.65 (.09)**	**.64 (.11)**	**.65 (.11)**
Conformity–	COR1	.99 (.04)	1	.98 (.05)	1	1	1	1
rules (COR)	COR2	.93 (.04)	.98 (.03)	.99 (.04)	.94 (.04)	.93 (.05)	.99 (.08)	.88 (.06)
	COR3	1	.97 (.03)	1	.92 (.04)	.94 (.04)	.96 (.07)	.93 (.06)
V/Con→COR		**.90 (.05)**	**1**	**.99 (.07)**	1	**.79 (.08)**	**.78 (.10)**	**.79 (.09)**
	COI1	.45 (.05)	.56 (.06)	.47 (.06)	.72 (.11)	.39 (.06)	.39 (.09)	.40 (.09)
	COI2	.67 (.06)	.74 (.07)	.69 (.07)	.85 (.13)	.71 (.09)	.70 (.14)	.73 (.09)

Conformity–interpersonal (COI)	COI3	1	1	1	1	1	1	1
V/Con→COI		**.68 (.06)**	**.65 (.06)**	**.71 (.06)**	**.53 (.09)**	**.66 (.08)**	**.57 (.10)**	**.73 (.09)**
Self-Direction–thought (SDT)	SDT1	1	1	1	.92 (.09)	1	1	1
	SDT2	.86 (.08)	.98 (.07)	.87 (.09)	1	.72 (.09)	.87 (.16)	.58 (.11)
	SDT3	.50 (.06)	.72 (.06)	.59 (.06)	.81 (.08)	.41 (.08)	.50 (.11)	.32 (.09)
V/Con→SDT		**–.30 (.05)**	**–.30 (.04)**	**–.31 (.05)**	**–.31 (.05)**	**–.35 (.07)**	**–.27 (.09)**	**–.41 (.10)**
Self-Direction–action (SDA)	SDA1	.82 (.09)	.90 (.08)	.86 (.13)	.91 (.11)	.90 (.10)	.92 (.16)	.87 (.14)
	SDA2	1	1	1	1	1	1	1
	SDA3	.67 (.10)	.84 (.08)	.69 (.11)	.93 (.11)	.56 (.08)	.52 (.11)	.61 (.10)
V/Con→SDA		**–.25 (.04)**	**–.22 (.03)**	**–.19 (.04)**	**–.26 (.05)**	**–.23 (.06)**	**–.20 (.07)**	**–.23 (.07)**
Stimulation (ST)	ST1	.35 (.05)	.41 (.06)	.42 (.07)	.40 (.09)	.41 (.07)	.37 (.11)	.43 (.08)
	ST2	1	1	1	1	1	1	1
	ST3	.58 (.06)	.69 (.07)	.66 (.08)	.75 (.10)	.70 (.08)	.71 (.11)	.66 (.09)
V/Con→ST		**–.55 (.07)**	**–.69 (.08)**	**–.66 (.08)**	**–.69 (.10)**	**–.79 (.12)**	**–.83 (.15)**	**–.80 (.13)**
			Common factor parameters not fixed					
Common factor	BEC1		.77 (.09)	.79 (.07)	.77 (.09)	.79 (.07)	.63 (.08)	.51 (.10)	.68 (.09)
	BEC2		.78 (.10)	.69 (.06)	.77 (.10)	.70 (.06)	.58 (.08)	.48 (.09)	.60 (.09)
	BEC3		.98 (.10)	.83 (.07)	.97 (.10)	.84 (.07)	.80 (.10)	.65 (.13)	.87 (.11)
	BED1		.77 (.10)	.76 (.07)	.75 (.10)	.78 (.07)	.67 (.08)	.61 (.12)	.67 (.08)
	BED2		.77 (.10)	.73 (.06)	.76 (.10)	.74 (.06)	.65 (.08)	.60 (.11)	.62 (.08)

BED3	.80 (.10)	.79 (.07)	.79 (.10)	.80 (.07)	.64 (.09)	.58 (.13)	.63 (.09)
UNC1	.75 (.11)	.76 (.06)	.74 (.11)	.76 (.06)	.69 (.10)	.65 (.13)	.66 (.12)
UNC2	.99 (.13)	.90 (.06)	.99 (.13)	.89 (.06)	.73 (.09)	.75 (.12)	.65 (.11)
UNC3	.79 (.13)	.89 (.06)	.79 (.13)	.90 (.06)	.78 (.10)	.78 (.14)	.71 (.12)
UNN1	.67 (.11)	.72 (.08)	.67 (.11)	.73 (.08)	.59 (.10)	.54 (.14)	.57 (.12)
UNN2	.69 (.12)	.71 (.09)	.69 (.12)	.71 (.09)	.60 (.10)	.52 (.13)	.62 (.12)
UNN3	.67 (.12)	.76 (.08)	.66 (.12)	.77 (.08)	.61 (.10)	.51 (.13)	.64 (.11)
UNT1	.77 (.12)	.83 (.05)	.77 (.12)	.82 (.06)	.67 (.08)	.65 (.11)	.62 (.10)
UNT2	.82 (.12)	1	.83 (.12)	1	.81 (.08)	.85 (.12)	.71 (.10)
UNT3	.64 (.10)	.74 (.05)	.64 (.10)	.74 (.05)	.70 (.08)	.68 (.10)	.65 (.09)
AC1	.91 (.10)	.88 (.09)	.90 (.10)	.89 (.09)	.95 (.07)	.83 (.10)	1
AC2	.86 (.11)	.80 (.12)	.86 (.11)	.83 (.12)	.89 (.10)	.88 (.15)	.88 (.09)
AC3	.72 (.09)	.52 (.09)	.72 (.09)	.54 (.09)	.76 (.09)	.72 (.13)	.76 (.09)
POD1	.32 (.09)	.18 (.10)	.29 (.09)	.20 (.10)	.39 (.10)	.42 (.13)	.36 (.12)
POD2	.36 (.10)	.15 (.11)	.36 (.10)	.16 (.11)	.38 (.10)	.42 (.13)	.36 (.11)
POD3	.31 (.10)	.13 (.10)	.31 (.10)	.14 (.10)	.43 (.09)	.50 (.12)	.37 (.10)
POR1	.29 (.10)	.17 (.11)	.29 (.11)	.18 (.11)	.33 (.11)	.31 (.15)	.36 (.12)
POR2	.44 (.11)	.29 (.10)	.43 (.11)	.31 (.10)	.30 (.11)	.28 (.15)	.32 (.12)
POR3	.25 (.10)	.14 (.09)	.24 (.10)	.15 (.09)	.19 (.10)	.16 (.13)	.24 (.10)
FAC1	.62 (.11)	.58 (.09)	.60 (.11)	.61 (.09)	.60 (.11)	.59 (.14)	.56 (.12)
FAC2	.85 (.10)	.63 (.10)	.82 (.10)	.67 (.10)	.73 (.10)	.64 (.13)	.75 (.11)
FAC3	.64 (.11)	.61 (.08)	.62 (.11)	.64 (.08)	.57 (.10)	.56 (.13)	.54 (.10)
COI1	.64 (.11)	.81 (.07)	.64 (.11)	.82 (.07)	.63 (.10)	.55 (.13)	.62 (.12)

COI2	.68 (.11)	.75 (.07)	.66 (.11)	.76 (.08)	.59 (.10)	.52 (.11)	.58 (.13)
COI3	.71 (.11)	.66 (.08)	.69 (.11)	.68 (.08)	.61 (.11)	.55 (.14)	.61 (.12)
COR1	.62 (.10)	.61 (.09)	.58 (.10)	.65 (.09)	.58 (.11)	.52 (.14)	.57 (.11)
COR2	.63 (.12)	.70 (.09)	.60 (.12)	.74 (.09)	.61 (.11)	.58 (.16)	.57 (.12)
COR3	.73 (.12)	.71 (.08)	.69 (.11)	.75 (.09)	.78 (.11)	.74 (.15)	.74 (.12)
SEP1	.89 (.10)	.74 (.08)	.87 (.10)	.76 (.08)	.76 (.09)	.70 (.15)	.75 (.09)
SEP2	.95 (.11)	.67 (.07)	.92 (.11)	.70 (.07)	.67 (.10)	.68 (.14)	.61 (.11)
SEP3	.71 (.11)	.46 (.08)	.68 (.11)	.50 (.09)	.53 (.11)	.49 (.15)	.51 (.13)
SES1	.78 (.10)	.56 (.07)	.75 (.10)	.59 (.07)	.59 (.09)	.54 (.13)	.58 (.09)
SES2	1.00 (.11)	.70 (.09)	.96 (.11)	.73 (.10)	.88 (.11)	.84 (.14)	.86 (.11)
SES3	.98 (.11)	.84 (.10)	.94 (.11)	.88 (.11)	.88 (.11)	.82 (.15)	.88 (.12)
TR1	.85 (.11)	.62 (.11)	.82 (.11)	.66 (.11)	.88 (.12)	.87 (.16)	.83 (.12)
TR2	.80 (.12)	.70 (.11)	.76 (.12)	.74 (.11)	.79 (.12)	.79 (.16)	.72 (.13)
TR3	.91 (.12)	.76 (.10)	.87 (.12)	.79 (.10)	.86 (.12)	.90 (.16)	.76 (.12)
ST1	.92 (.11)	.83 (.09)	.92 (.11)	.83 (.09)	.89 (.07)	.85 (.11)	.88 (.10)
ST2	.67 (.10)	.38 (.10)	.68 (.10)	.37 (.10)	.68 (.10)	.76 (.16)	.63 (.12)
ST3	.95 (.10)	.98 (.08)	.95 (.10)	.98 (.08)	1	1	.97 (.08)
SDA1	.71 (.11)	.59 (.06)	.70 (.11)	.59 (.07)	.64 (.08)	.46 (.10)	.73 (.09)
SDA2	.67 (.09)	.69 (.08)	.66 (.09)	.69 (.08)	.68 (.07)	.60 (.10)	.71 (.08)
SDA3	.64 (.08)	.61 (.07)	.64 (.08)	.62 (.07)	.58 (.06)	.50 (.08)	.60 (.07)
SDT1	.46 (.09)	.57 (.08)	.46 (.09)	.57 (.08)	.48 (.08)	.45 (.11)	.47 (.10)
SDT2	.67 (.10)	.72 (.07)	.66 (.10)	.73 (.07)	.65 (.07)	.57 (.11)	.66 (.08)
SDT3	.64 (.10)	.85 (.08)	.64 (.10)	.85 (.08)	.69 (.08)	.61 (.11)	.70 (.10)

HE1	.91 (.07)	.67 (.07)	.90 (.07)	.67 (.07)	.82 (.08)	.85 (.10)	.76 (.10)
HE2	.99 (.09)	.71 (.06)	1.00 (.09)	.70 (.07)	.85 (.07)	.89 (.12)	.79 (.09)
HE3	1	.62 (.10)	1	.61 (.10)	.90 (.11)	.92 (.16)	.89 (.13)
HU1	.34 (.11)	.56 (.08)	.33 (.11)	.56 (.08)	.58 (.11)	.60 (.15)	.50 (.13)
HU2	.63 (.11)	.60 (.07)	.62 (.11)	.61 (.07)	.70 (.10)	.74 (.14)	.59 (.12)
HU3	.41 (.10)	.30 (.08)	.40 (.10)	.31 (.08)	.51 (.11)	.35 (.13)	.61 (.14)

Note. V/Sel = Self-transcendence vs. self-enhancement. V/Con = Conservation vs. openness to change. Fixed = parameters fixed across dependent groups. Self-rater / Target / Informant / Twin 1 / Twin 2: Coefficients as found by free parameter estimation for the respective group.

Table B3. *Parameter Estimates of Hierarchical Confirmatory Factor Analyses of Moral Foci for all Subsamples*

			Multi-rater			Twin		
		Self-rater	Fixed	Target	Informant	Fixed	Twin 1	Twin 2
Factor	Item	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)
Care vs. Harm	EMOT	1	.90 (.09)	.97 (.15)	.86 (.10)	1	1	1
(CARE)	WEAK	.70 (.11)	.87 (.09)	.93 (.15)	.84 (.11)	.66 (.12)	.72 (.28)	.67 (.16)
	COMP	.65 (.09)	1	1	1	.73 (.17)	.80 (.37)	.75 (.20)
	ANIM	.30 (.10)	.47 (.08)	.47 (.14)	.47 (.09)	.23 (.16)	.19 (.27)	.28 (.20)
M/Soc→CARE		**1**	**1**	**1**	**1**	**1**	**1**	**1**
Fairness vs.	TREA	1	1	1	1	1	1	1
Cheating	UNFA	.36 (.07)	.58 (.12)	.53 (.17)	.59 (.17)	.14 (.16)	.16 (.23)	.14 (.22)
(FAIR)	FAIR	.37 (.07)	.55 (.11)	.53 (.14)	.55 (.15)	.19 (.15)	.28 (.20)	.17 (.22)
	JUST	.18 (.06)	.39 (.10)	.42 (.10)	.36 (.14)	.12 (.11)	.10 (.11)	.14 (.18)
M/Soc→FAIR		**1**	**1**	**1**	**1**	**1**	**1**	**1**
Loyalty vs.	BETR	.08 (.07)	.20 (.06)	.18 (.07)	.21 (.09)	.08 (.16)	.07 (.15)	.10 (.31)
Betrayal	LOYA	.58 (.09)	.64 (.10)	.67 (.12)	.62 (.12)	.59 (.17)	.50 (.18)	.74 (.27)
(LOYA)	FAMI	1	1	1	1	1	1	1
	TEAM	.32 (.07)	.37 (.06)	.40 (.08)	.34 (.07)	.38 (.10)	.39 (.11)	.41 (.16)
M/Org→LOYA		**.57 (.06)**	**.65 (.05)**	**.58 (.06)**	**.72 (.07)**	**.67 (.11)**	**.73 (.19)**	**.60 (.13)**
Authority vs.	RESP	.86 (.06)	.91 (.05)	.91 (.07)	.9 (.06)	.92 (.13)	.92 (.17)	.91 (.17)
Subversion	TRAD	1	1	1	1	1	1	1
(AUTH)	KIDR	.77 (.07)	.85 (.06)	.77 (.07)	.93 (.07)	.83 (.16)	.83 (.20)	.82 (.21)
	SOLD	.68 (.07)	.68 (.06)	.64 (.07)	.71 (.08)	.71 (.16)	.62 (.17)	.80 (.23)

M/Org→AUTH		**1**	**.90 (.05)**		**.84 (.06)**	**.97 (.07)**	**1**	**1.00 (.21)**	**1**
Sanctity vs.	DECE	.62 (.05)	.61 (.05)		.59 (.06)	.64 (.06)	.37 (.08)	.40 (.10)	.34 (.11)
Degradation	DISG	.75 (.04)	.76 (.03)		.74 (.05)	.79 (.05)	.72 (.06)	.76 (.08)	.67 (.09)
(SANC)	HARM	1	1		1	1	1	1	1
	UNNA	.92 (.04)	.85 (.03)		.85 (.04)	.85 (.05)	.77 (.05)	.79 (.06)	.73 (.08)
M/Org→SANC		**.97 (.05)**	**1**		**1**	**1**	**.99 (.19)**	**1**	**.98 (.27)**
			Common factor parameters not fixed						
Common factor	EMOT	.35 (.06)	.40 (.06)	.39 (.07)	.39 (.06)	.40 (.08)	.50 (.13)	.55 (.14)	.44 (.21)
Relevance	WEAK	.53 (.07)	.51 (.08)	.63 (.08)	.50 (.08)	.63 (.09)	.68 (.12)	.58 (.12)	.69 (.25)
	TREA	.40 (.06)	.36 (.07)	.49 (.08)	.35 (.07)	.49 (.08)	.60 (.15)	.68 (.16)	.52 (.25)
	UNFA	.75 (.05)	.72 (.07)	.66 (.08)	.72 (.07)	.67 (.10)	.78 (.16)	.73 (.13)	.76 (.26)
	BETR	1	1	1	1	1	.99 (.13)	1	.93 (.12)
	LOYA	.72 (.06)	.80 (.08)	.96 (.08)	.81 (.08)	.96 (.08)	.99 (.11)	.92 (.14)	.99 (.10)
	RESP	.47 (.06)	.42 (.08)	.60 (.10)	.42 (.08)	.6 (.10)	.75 (.07)	.80 (.21)	.65 (.20)
	TRAD	.35 (.07)	.29 (.08)	.59 (.10)	.29 (.08)	.59 (.11)	.67 (.13)	.50 (.25)	.71 (.13)
	DECE	.73 (.07)	.74 (.08)	.99 (.12)	.74 (.08)	.99 (.13)	1	.99 (.22)	.93 (.19)
	DISG	.74 (.06)	.75 (.09)	.94 (.11)	.75 (.09)	.94 (.12)	.95 (.13)	.81 (.23)	1
Common factor	COMP	.86 (.09)	.77 (.15)	.73 (.12)	.78 (.15)	.71 (.13)	.96 (.12)	.98 (.16)	.83 (.15)
Judgment	ANIM	1	1	.83 (.13)	1	.81 (.15)	1		
	FAIR	.71 (.10)	.83 (.16)	.83 (.08)	.83 (.16)	.82 (.08)	.79 (.21)	.88 (.21)	.69 (.34)
	JUST	.91 (.11)	.91 (.18)	1	.88	1	.90 (.20)	.91 (.21)	.87 (.36)
	FAMI	.56 (.09)	.36 (.13)	.43 (.11)	.37 (.14)	.43 (.11)	.62 (.12)	.51 (.16)	.69 (.17)

	TEAM	.48 (.09)	.46 (.14)	.57 (.11)	.46 (.14)	.57 (.11)	.65 (.13)	.65 (.13)	.57 (.17)
	KIDR	.74 (.10)	.33 (.13)	.42 (.10)	.35 (.13)	.41 (.10)	.39 (.10)	.40 (.15)	.32 (.13)
	SOLD	.33 (.07)	–.28 (.14)	–.23 (.11)	–.26 (.14)	–.23 (.11)	–.13 (.14)	–.08 (.18)	–.22 (.17)
	HARM	–.02 (.09)	.76 (.16)	.77 (.15)	.75 (.16)	.76 (.17)	.82 (.16)	.79 (.20)	.75 (.21)
	UNNA	.44 (.08)	.47 (.13)	.48 (.12)	.47 (.13)	.47 (.12)	.59 (.13)	.44 (.18)	.72 (.16)

Note. M/Soc = Moral focus on social outcomes vs. individual outcomes. M/Org = Moral focus on organization vs. opportunity. Fixed = parameters fixed across dependent groups. Self-rater / Target / Informant / Twin 1 / Twin 2: Coefficients as found by free parameter estimation for the respective group.

Table B4. *Model Fit Indices of Confirmatory Factor Analyses of HEXACO Personality Trait Dimensions*

Subsample	*n*	χ^2	*df*	RMSEA [90% CI]	SRMR
Self-rater					
Free[1]	1421	8210.74	1695	.052 [.051, .053]	.069
Free[2]	2900[2]	19424.38	5085	.054 [.054, .055]	.073
Fixed[2]	2900[2]	19506.72	5193	.054 [.053, .055]	.073
Multi-rater					
Free	924	21244.11	6954	.047 [.046, .048]	.070
Fixed	924	21415.15	7038	.047 [.046, .048]	.071
Twin					
Free	555	14405.47	6954	.044 [.043, .045]	.069
Fixed	555	14471.98	7038	.044 [.043, .045]	.069

Note. All χ^2 tests were significant ($p < .001$). Shown are scaling-corrected χ^2 test statistics. RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; RMSEA's of baseline models: Self-rater: RMSEA = .088; Multi-rater: RMSEA = .074; Twin: RMSEA = .067.

[1]Estimated as single group.

[2]Estimated in multi group analysis (self-ratings from the self-rater and multi-rater subsamples and from twin 1 of the twin subsample).

Table B5. *Parameter Estimates of Hierarchical Confirmatory Factor Analyses of HEXACO Personality Trait Dimensions for all Subsamples*

			Multi-rater			Twin		
		Self-rater	Fixed	Target	Informant	Fixed	Twin 1	Twin 2
Personality trait	Item	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)
Honesty-	Hsinc4	.50 (.05)	.44 (.07)	.47 (.10)	.41 (.07)	.49 (.07)	.55 (.09)	.45 (.09)
humility	Hsinc5R	.40 (.04)	.38 (.07)	.34 (.09)	.43 (.08)	.40 (.06)	.45 (.07)	.34 (.08)
	Hsinc6	.41 (.04)	.37 (.07)	.35 (.09)	.38 (.08)	.39 (.07)	.41 (.09)	.38 (.09)
	Hgree2	.36 (.04)	.43 (.07)	.45 (.09)	.41 (.08)	.30 (.06)	.32 (.08)	.29 (.07)
	Hgree7R	.50 (.05)	.58 (.08)	.57 (.11)	.60 (.10)	.61 (.07)	.64 (.09)	.59 (.09)
	Hfair1R	1	1	1	1	1	1	1
	Hfair6	.59 (.04)	.59 (.05)	.53 (.07)	.63 (.06)	.57 (.06)	.56 (.07)	.59 (.09)
	Hfair8R	.90 (.03)	.92 (.02)	.91 (.03)	.93 (.03)	.85 (.04)	.82 (.05)	.87 (.05)
	Hmode6R	.21 (.03)	.27 (.05)	.25 (.06)	.29 (.07)	.13 (.05)	.12 (.06)	.14 (.06)
	Hmode8R	.31 (.04)	.36 (.07)	.37 (.08)	.35 (.09)	.33 (.06)	.29 (.07)	.38 (.08)
Emotionality	Esent1	.75 (.09)	.92 (.09)	.77 (.08)	1	.97 (.15)	1	.85 (.15)
	Esent3	.66 (.07)	.73 (.07)	.66 (.07)	.75 (.05)	.82 (.11)	.80 (.09)	.75 (.13)
	Esent7R	.67 (.09)	.81 (.09)	.74 (.07)	.82 (.05)	.77 (.15)	.80 (.07)	.67 (.15)
	Eanxi1	1	1	.93 (.10)	.98 (.09)	1	.87 (.21)	1
	Eanxi4R	.82 (.04)	.85 (.04)	.84 (.09)	.80 (.09)	.89 (.05)	.81 (.18)	.87 (.06)
	Efear1	.55 (.05)	.69 (.06)	.60 (.08)	.71 (.08)	.74 (.08)	.69 (.13)	.70 (.09)
	Efear7	.66 (.06)	.77 (.06)	.74 (.08)	.75 (.08)	.91 (.10)	.92 (.14)	.80 (.10)
	Efear8R	.71 (.06)	.84 (.06)	.82 (.07)	.80 (.08)	.82 (.08)	.77 (.13)	.77 (.10)
	Edepe3	.81 (.09)	.89 (.08)	.97 (.06)	.79 (.06)	.95 (.14)	.89 (.09)	.90 (.15)

	Edepe6R	.85 (.07)	.93 (.07)	1	.81 (.07)	.95 (.11)	.89 (.11)	.90 (.12)
Extraversion	Xsocb3	.59 (.06)	.79 (.09)	.75 (.09)	.83 (.12)	.53 (.06)	.58 (.08)	.48 (.08)
	Xsocb4	.54 (.06)	.62 (.09)	.59 (.09)	.64 (.11)	.54 (.06)	.57 (.08)	.51 (.09)
	Xsoci5	.57 (.07)	.68 (.09)	.62 (.09)	.73 (.11)	.39 (.06)	.41 (.08)	.38 (.08)
	Xsoci6	.46 (.05)	.68 (.08)	.61 (.08)	.74 (.10)	.46 (.05)	.46 (.07)	.46 (.07)
	Xsses1	.80 (.04)	.83 (.03)	.74 (.05)	.91 (.04)	.69 (.03)	.76 (.05)	.62 (.04)
	Xsocb2R	.63 (.06)	.68 (.08)	.77 (.08)	.59 (.10)	.61 (.07)	.60 (.08)	.61 (.10)
	Xsses5R	.77 (.04)	.89 (.05)	.82 (.05)	.94 (.06)	.76 (.04)	.77 (.06)	.74 (.05)
	Xsses8R	1	1	1	1	1	1	1
	Xlive3	.80 (.04)	.89 (.04)	.85 (.05)	.93 (.06)	.76 (.04)	.83 (.05)	.69 (.06)
	Xlive7R	.52 (.05)	.65 (.07)	.68 (.08)	.60 (.09)	.47 (.06)	.47 (.07)	.47 (.08)
Agreeableness	Agent4R	.81 (.08)	.99 (.05)	.92 (.10)	.97 (.06)	.82 (.07)	.72 (.09)	.96 (.10)
	Agent6	.63 (.07)	.77 (.05)	.67 (.08)	.79 (.06)	.58 (.08)	.55 (.09)	.61 (.10)
	Agent7	.64 (.06)	.81 (.06)	.66 (.07)	.85 (.06)	.63 (.08)	.60 (.08)	.68 (.13)
	Aflex1R	.84 (.08)	1	.88 (.09)	1	1	1	1
	Aflex5	.43 (.06)	.47 (.05)	.38 (.06)	.50 (.06)	.47 (.07)	.43 (.07)	.52 (.12)
	Aforg1	1	.99 (.07)	1	.94 (.07)	.87 (.09)	.78 (.11)	.99 (.15)
	Aforg3	.76 (.06)	.76 (.06)	.81 (.06)	.69 (.07)	.71 (.09)	.66 (.10)	.78 (.13)
	Aflex7R	.57 (.06)	.89 (.05)	.70 (.08)	.94 (.06)	.73 (.06)	.73 (.08)	.72 (.09)
	Apati2R	.69 (.07)	.75 (.05)	.69 (.08)	.74 (.06)	.74 (.07)	.61 (.07)	.91 (.12)
	Apati4	.91 (.06)	1.00 (.06)	.95 (.07)	.96 (.07)	.87 (.07)	.79 (.08)	.97 (.12)
Conscientious-	Cperf2R	.59 (.07)	.64 (.05)	.55 (.07)	.69 (.05)	.57 (.05)	.52 (.07)	.53 (.08)
ness	Cperf3	.69 (.06)	.72 (.05)	.65 (.06)	.76 (.06)	.79 (.06)	.81 (.07)	.65 (.08)

	Cperf4	.80 (.08)	.84 (.06)	.83 (.09)	.85 (.06)	1	1	.86 (.11)
	Cdili2	.71 (.06)	.58 (.04)	.64 (.06)	.55 (.05)	.71 (.07)	.61 (.08)	.70 (.08)
	Cdili6R	.87 (.06)	.76 (.04)	.71 (.06)	.80 (.05)	.96 (.10)	.76 (.11)	1
	Corga3	.95 (.06)	.93 (.04)	.91 (.06)	.94 (.05)	.89 (.10)	.84 (.13)	.81 (.10)
	Corga8R	1	1	1	1	.92 (.11)	.89 (.14)	.80 (.09)
	Cprud2R	.78 (.07)	.71 (.04)	.64 (.07)	.75 (.05)	.60 (.08)	.59 (.09)	.52 (.10)
	Cprud3R	.90 (.06)	.74 (.04)	.72 (.06)	.75 (.04)	.93 (.10)	.88 (.12)	.82 (.10)
	Cprud8R	.94 (.06)	.77 (.04)	.75 (.06)	.78 (.05)	.78 (.08)	.78 (.10)	.65 (.09)
Openness to	Oaesa1R	1	1	.95 (.07)	1	1	1	1
experience	Oaesa4	.98 (.04)	.88 (.05)	.85 (.06)	.87 (.05)	.97 (.06)	.97 (.08)	.97 (.08)
	Ocrea6	.83 (.05)	.90 (.05)	.83 (.06)	.91 (.06)	.85 (.07)	.86 (.08)	.83 (.08)
	Ocrea7	.26 (.04)	.36 (.04)	.38 (.05)	.33 (.05)	.36 (.05)	.34 (.07)	.37 (.06)
	Ocrea8R	.32 (.05)	.45 (.05)	.39 (.06)	.48 (.06)	.51 (.06)	.51 (.09)	.50 (.08)
	Oinqu1	.62 (.04)	.73 (.06)	.66 (.06)	.75 (.06)	.56 (.06)	.51 (.08)	.60 (.07)
	Oinqu8R	.65 (.05)	.72 (.05)	.73 (.06)	.68 (.06)	.57 (.06)	.56 (.08)	.57 (.07)
	Ounco2R	.20 (.04)	.30 (.04)	.30 (.05)	.29 (.05)	.21 (.05)	.22 (.07)	.19 (.07)
	Ounco5	.36 (.03)	.41 (.04)	.38 (.04)	.41 (.05)	.34 (.04)	.36 (.05)	.32 (.05)
	Ounco8R	.84 (.05)	.99 (.06)	1	.94 (.06)	.80 (.07)	.75 (.09)	.85 (.08)
Correlations		*r* (*p*)	*r* (*p*)	*r* (*p*)	*r* (*p*)	*r* (*p*)	*r* (*p*)	*r* (*p*)
	H–E	.04 (.316)	.18 (< .001)	–.00 (.951)	.04 (.465)	.08 (.123)	.13 (.111)	.04 (.616)
	H–X	.22 (< .001)	.15 (.001)	.16 (.006)	.13 (.012)	.18 (< .001)	.15 (.023)	.22 (.001)
	H–A	.26 (< .001)	.32 (< .001)	.32 (< .001)	.35 (< .001)	.24 (< .001)	.26 (< .001)	.21 (.004)
	H–C	.40 (< .001)	.34 (< .001)	.30 (< .001)	.36 (< .001)	.40 (< .001)	.40 (< .001)	.39 (< .001)

H–O	.15 (< .001)	.17 (< .001)	.15 (.004)	.21 (< .001)	.07 (.190)	.07 (.256)	.06 (.336)
E–X	–.24 (< .001)	–.23 (.001)	–.22 (.430)	–.21 (.001)	–.30 (.001)	–.28 (.001)	–.31 (.005)
E–A	–.15 (.005)	–.11 (.021)	–.13 (.023)	–.07 (.125)	–.13 (.043)	–.10 (.160)	–.15 (.068)
E–C	–.03 (.399)	–.06 (.142)	–.09 (.077)	–.01 (.777)	.04 (.420)	.01 (.844)	.07 (.286)
E–O	.01 (.781)	–.02 (.652)	–.05 (.430)	.01 (.802)	–.10 (.049)	–.11 (.073)	–.08 (.223)
X–A	.20 (< .001)	.33 (< .001)	.25 (< .001)	.36 (< .001)	.33 (< .001)	.27 (.001)	.34 (< .001)
X–C	.31 (< .001)	.19 (< .001)	.21 (.001)	.13 (.010)	.29 (< .001)	.26 (< .001)	.30 (< .001)
X–O	.15 (< .001)	.22 (< .001)	.26 (< .001)	.15 (< .001)	.13 (.005)	.18 (.001)	.08 (.177)
A–C	.01 (.772)	.03 (.430)	.00 (.991)	.05 (.254)	–.01 (.808)	–.02 (.782)	–.01 (.840)
A–O	.01 (.893)	.09 (.032)	.10 (.031)	.06 (.196)	.04 (.441)	.09 (.210)	–.01 (.885)
C–O	.12 (.002)	.18 (< .001)	.16 (.001)	.16 (.001)	.15 (.005)	.14 (.041)	.16 (.015)

Note. H = Honesty-humility; E = Emotionality; X = Extraversion; A = Agreeableness; C = Conscientiousness; O = Openness to experience. Fixed = parameters fixed across dependent groups. Self-rater / Target / Informant / Twin 1 / Twin 2: Coefficients as found by free parameter estimation for the respective group.

Table B6. *Model Parameters for HEXACO Latent Trait Model*

Personality trait	Indicator	Unst. est.	Stand. est.	*p*
Honesty-humility	Self: H	1	.62	
	Info: H	1	.61	
Emotionality	Self: E	1	.80	
	Info: E	1	.76	
Extraversion	Self: X	1	.78	
	Info: X	1	.75	
Agreeableness	Self: A	1	.69	
	Info: A	1	.59	
Conscientiousness	Self: C	1	.81	
	Info: C	1	.71	
Openness to experience	Self: O	1	.80	
	Info: O	1	.77	
Method: Self	Self: H	.32	.15	.082
	Self: E	–.38	–.18	.009
	Self: X	1	.47	
	Self: A	.08	.04	.540
	Self: C	.65	.31	.010
	Self: O	.48	.23	.001
Method: Informant	Info: H	1	.48	
	Info: E	–.41	–.19	.024
	Info: X	.30	.14	.234
	Info: A	.84	.38	.004
	Info: C	.57	.25	.008
	Info: O	.19	.09	.157

Note. Self = Mean score of self-report; Info = Mean score of informant report; Unst. est. = Unstandardized estimate; Stand. est. = Standardized estimate.

Supplement C: Results of Bivariate Twin Model Analyses

Table C1. *Model Statistics for the Full and Most Parsimonious Common Pathway Model for V/Con and M/Org*

	Full Model					Most Parsimonious Model				
Model indices	*b*	*SE*	β	*p*	R^2	*b*	*SE*	β	*p*	R^2
V/Con										
a_c:	.23	.04	.55	< .001	.12	.23	.04	.55	< .001	.12
c_c:	.31	.03	.76	< .001	.22	.31	.03	.76	< .001	.22
e_c:	.14	.02	.34	< .001	.04	.14	.02	.34	< .001	.04
Common→V/Con	1		.62		**.38**	1		.62		**.38**
a_{rv}:	.39	.05	.59	< .001	.35	.39	.05	.59	< .001	.35
c_{rv}:	.22	.08	.33	.004	.11	.22	.08	.33	.004	.11
e_{rv}:	.27	.02	.40	< .001	.16	.27	.02	.40	< .001	.16
M/Org										
a_c:	.23	.04	.55	< .001	.17	.23	.04	.55	< .001	.17
c_c:	.31	.03	.76	< .001	.32	.31	.03	.76	< .001	.32
e_c:	.14	.02	.34	< .001	.07	.14	.02	.34	< .001	.06
Common→M/Org	1		.75		**.56**	1		.75		**.56**
a_{rm}:	.00	$.77\times10^7$	.00	> .999	.00					
c_{rm}:	.30	.03	.54	< .001	.29	.30	.02	.54	< .001	.29
e_{rm}:	.22	.02	.39	< .001	.15	.22	.01	.39	< .001	.16
Model fit	χ^2 (11) = 20.807, *p* = .035					χ^2 (12) = 20.807, *p* = .053				
	CFI = .990					CFI = .991				
	ECVI = .099					ECVI =.095				
	RMSEA = .040, 90% CI [.010, .066]					RMSEA = .036, 90% CI [.000, .062]				

Note. *b* = Unstandardized path coefficient; β = Standardized path coefficient; Common = Common factor; a_c = Additive genetic effects on the common factor; c_c = Shared environmental effects on the common factor; e_c = Nonshared environmental effects on the common factor; a_{rv} = Residual additive genetic effects on V/Con; c_{rv} = Residual shared environmental effects on V/Con; e_{rv} = Residual nonshared environmental effects on V/Con; a_{rm} = Residual additive genetic effects on M/Org; c_{rm} = Residual shared environmental effects on M/Org; e_{rm} = Residual nonshared environmental effects on M/Org.

Table C2. *Model Statistics for the Full and Most Parsimonious Common Pathway Model for V/Sel and M/Soc*

	Full Model					Most Parsimonious Model				
Model indices	*b*	*SE*	β	*p*	R^2	*b*	*SE*	β	*p*	R^2
V/Sel										
a_c:	.16	.08	.50	.047	.04					
c_c:	.21	.05	.67	< .001	.07	.25	.02	.80	< .001	.11
e_c:	.17	.02	.55	< .001	.05	.19	.02	.60	< .001	.06
Common→V/Sel	1		.41		**.17**	1		.41		**.17**
a_{rv}:	.44	.07	.58	< .001	.34	.44	.07	.59	< .001	.34
c_{rv}:	.31	.08	.41	.049	.17	.31	.08	.40	< .001	.16
e_{rv}:	.44	.02	.57	< .001	.33	.44	.02	.58	< .001	.33
M/Soc										
a_c:	.16	.08	.50	.047	.14					
c_c:	.21	.05	.67	< .001	.26	.25	.02	.80	< .001	.37
e_c:	.17	.02	.55	< .001	.17	.19	.02	.60	< .001	.20
Common→M/Soc	1		.76		**.58**	1		.76		**.58**
a_{rm}:	.15	.08	.37	.068	.14	.20	.03	.50	< .001	.24
c_{rm}:	.12	.09	.29	.177	.08					
e_{rm}:	.19	.02	.46	< .001	.21	.18	.02	.43	< .001	.19
Model fit	χ^2 (11) = 50.165, p < .001					χ^2 (13) = 51.153, p < .001				
	CFI = .918					CFI = .920				
	ECVI = .152					ECVI = .147				
	RMSEA = .080, 90% CI [.059, .103]					RMSEA = .073, 90% CI [.053, .094]				

Note. *b* = Unstandardized path coefficient; β = Standardized path coefficient; Common = Common factor; a_c = Additive genetic effects on the common factor; c_c = Shared environmental effects on the common factor; e_c = Nonshared environmental effects on the common factor; a_{rv} = Residual additive genetic effects on V/Sel; c_{rv} = Residual shared environmental effects on V/Sel; e_{rv} = Residual nonshared environmental effects on V/Sel; a_{rm} = Residual additive genetic effects on M/Soc; c_{rm} = Residual shared environmental effects on M/Soc; e_{rm} = Residual nonshared environmental effects on M/Soc.

Supplement D: Zero-Order Correlations between Value Orientations, Moral Foci, and HEXACO Personality Trait Dimensions

Table D1. *Zero-Order Correlations of V/Con and M/Org with HEXACO Personality Trait Dimensions*

Personality trait dimension	Subsample	V/Con			M/Org		
		r	95% CI	*p*	*r*	95% CI	*p*
Emotionality	Self-rater	**.23**	[.18, .28]	< .001	.04	[–.01, .10]	.099
	Twin	**.32**	[.27, .37]	< .001	**.09**	[.03, .15]	.004
	Multi-rater (Target)	**.25**	[.19, .31]	< .001	.05	[.02, .11]	.146
	Multi-rater (Informant)	**.24**	[.18, .30]	< .001	.06	[–.00, .13]	.052
Extraversion	Self-rater	**–.16**	[–.21, –.11]	< .001	**.07**	[.02, .12]	.009
	Twin	**–.23**	[–.29, –.18]	< .001	**.06**	[.00, .12]	.049
	Multi-rater (Target)	**–.26**	[–.31, –.19]	< .001	–.02	[–.08, .05]	.604
	Multi-rater (Informant)	**–.21**	[–.27, –.14]	< .001	.02	[–.05, .08]	.604
Agreeableness	Self-rater	**.16**	[.11, .21]	< .001	.00	[–.05, .05]	.908
	Twin	**.09**	[.04, .15]	.002	**.09**	[.03, .15]	.002
	Multi-rater (Target)	**.10**	[.04, .16]	.002	.01	[–.06, .07]	.853
	Multi-rater (Informant)	**.10**	[.04, .16]	.002	–.02	[–.09, .05]	.490
Conscientious-ness	Self-rater	**.14**	[.09, .19]	< .001	**.12**	[.07, .18]	< .001
	Twin	.05	[–.01, .11]	.087	.02	[–.04, .08]	.555
	Multi-rater (Target)	**.18**	[.12, .24]	< .001	**.16**	[.10, .23]	< .001
	Multi-rater (Informant)	**.20**	[.14, .26]	< .001	**.17**	[.11, .23]	< .001

Note. V/Con = Conservation vs. openness to change; M/Org = Moral focus on organization vs. opportunity. Significant correlations ($p < .05$) are bold-faced.

Table D2. *Zero-Order Correlations of V/Sel and M/Soc with HEXACO Personality Trait Dimensions*

Personality trait dimension	Subsample	V/Sel			M/Soc		
		r	95% CI	*p*	*r*	95% CI	*p*
Emotionality	Self-rater	**.12**	[.07, .17]	< .001	**.22**	[.17, .27]	< .001
	Twin	**.15**	[.09, .21]	< .001	**.17**	[.11, .23]	< .001
	Multi-rater (Target)	**.12**	[.06, .19]	< .001	**.20**	[.14, .26]	< .001
	Multi-rater (Informant)	**.11**	[.05, .17]	< .001	**.16**	[.10, .23]	< .001
Extraversion	Self-rater	–.02	[–.07, .04]	.547	**.06**	[.01, .11]	.023
	Twin	.01	[–.05, .07]	.662	**.08**	[.02, .13]	.011
	Multi-rater (Target)	.01	[–.05, .08]	.671	.03	[–.03, .10]	.330
	Multi-rater (Informant)	.06	[–.01, .12]	.075	**.11**	[.05, .18]	< .001
Agreeableness	Self-rater	**.25**	[.21, .30]	< .001	**.10**	[.04, .15]	< .001
	Twin	**.27**	[.22, .32]	< .001	**.13**	[.07, .19]	< .001
	Multi-rater (Target)	**.25**	[.19, .31]	< .001	**.07**	[.00, .13]	.038
	Multi-rater (Informant)	**.37**	[.32, .43]	< .001	**.11**	[.05, .18]	< .001
Conscientious-ness	Self-rater	.03	[–.02, .08]	.302	**.10**	[.04, .15]	< .001
	Twin	**.07**	[.01, .13]	.025	.02	[–.04, .07]	.595
	Multi-rater (Target)	–.01	[–.07, .06]	.859	**.08**	[.02, .15]	.012
	Multi-rater (Informant)	.03	[–.04, .09]	.370	**.13**	[.07, .19]	< .001

Note. V/Sel = Self-transcendence vs. Self-enhancement; M/Soc = Moral focus on social vs. individual outcomes. Significant correlations ($p < .05$) are bold-faced.