How do Basic Personality Traits Map onto Moral Judgements of Fairness-related Actions?

Milan Andrejević¹, Luke D. Smillie¹, Daniel Feuerriegel¹, William F. Turner¹, Simon M. Laham¹, Stefan Bode¹

1. Melbourne School of Psychological Sciences, The University of Melbourne, Parkville, Victoria 3010, Australia

Corresponding Author: Milan Andrejević

milan.andrejevic@unimelb.edu.au

Postal Address: Milan Andrejević, Melbourne School of Psychological Sciences, Redmond Barry Building, The University of Melbourne, Parkville, Victoria 3010, Australia

Abstract

Adherence to fairness norms is a core feature of moral behaviour and judgment, and is conceptually and empirically linked with basic personality dimensions. However, the specific nature of these links is poorly understood. In this study ($N = 313$, 68% female) we employed a novel third-party judgement paradigm, in which participants made moral judgements of various sharing actions of virtual others. This allowed us to capture individual variation in the relative importance of several fairness norms. We correlated these norm profiles with Big Five personality traits. We observed distinct associations between Agreeableness, Conscientiousness, Openness, and Extraversion and estimates of the importance of generosity, selfishness, relative generosity, and relative selfishness norms. Comparisons of these associations at the domain- versus facet-level of personality traits suggested these relations are specific to domain-level traits. These findings are an important step to unravel the complex links between fairness norms and basic personality traits.

Keywords: moral judgement, fairness norms, third-party, Big Five, basic personality traits

Mounting evidence at the interface of moral psychology and personality science shows that individuals differ in the extent of their moral concern for harm, fairness, authority, loyalty and purity, and that these differences are related to basic personality traits (Hirsh et al., 2010; Lewis & Bates, 2011; Zeigler-Hill et al., 2015). Basic personality traits also relate to individual differences in moral virtues (Cawley et al., 2000), and they predict moral behaviours, judgements, and decisions (Bulmer et al., 2017; Kroneisen & Heck, 2020; Smillie et al., 2020; Tao et al., 2020; Zhou et al., 2019). Situations of moral choice have been conceptualized as ‘affordances’, i.e. opportunities for personality traits to be activated and expressed in behaviour (Rusbult & Van Lange, 2003; Tett & Guterman, 2000). Studying links between moral choice and personality traits can improve our understanding of the psychological processes afforded by different moral decision-making situations, and characterise heterogeneity in moral behaviours across individuals. In this paper, we examine how personality traits may help to explain heterogeneity in adherence to fairness norms.

One means to describe the mapping between personality traits and moral decision-making is through the use of economic game paradigms. Economic games provide simplified models of behaviour in interdependent situations where one or more parties make decisions affecting the economic outcomes for some or all parties (Camerer, 2003a; Pruitt & Kimmel, 1977). For example, in the Dictator Game (Forsythe et al., 1994) two participants are paired and one participant is randomly assigned to decide how much of a fixed stake to share with the other. The amount shared is indicative of the importance an individual places on fairness. Alternatively, a participant may be instructed to share a stake with a partner while knowing that their partner may reject the offer, in which case both participants get nothing (i.e. the Ultimatum Game; Güth et al., 1982). Here, a participant’s response reflects not only her fairness preference, but also her expectation about what the other participant will judge to be sufficiently fair. Such games can vary greatly in structure and instructions and serve as

models for a range of relevant social phenomena such as reciprocity, trust, altruism, punishment, and cooperation (Rilling & Sanfey, 2011).

One of the most salient features of behaviour observed within such games is the sizable inter-individual variability: whereas some people maximize profit without concern for fairness, some adhere strictly to equality norms, and some generously sacrifice their profit for an others' benefit (Blount, 1995; Camerer, 2003b; Engel, 2011). These differences are relatively stable across games and over time (Peysakhovich et al., 2014; Reigstad et al., 2017; Yamagishi et al., 2013, 2014) and correlate with basic personality traits (Thielmann et al., 2020; Zhao & Smillie, 2015). Many studies have employed the comprehensive trait taxonomies provided by the Big Five (John et al., 2008) and HEXACO (Marcus et al., 2007) frameworks. These reveal Agreeableness as a prominent predictor of prosocial (i.e. other-benefiting) behaviour across several kinds of games, whereas HEXACO Honesty-Humility specifically relates to prosocial games that afford an opportunity for exploitation of others (Thielmann et al., 2020). Similarly, if a game affords punishment of a partner's wrongdoing, prosocial behaviour benefitting the partner correlates negatively with Neuroticism (Zhao & Smillie, 2015). These diverging patterns of trait correlations suggests that small changes in game structure and instructions (i.e. the context surrounding the social interaction) may have a strong impact on fairness-related behaviours, and the personality traits that best account for them.

Although these studies have helped illuminate the links between personality traits and social preferences, most have used single-shot games, in which participants make only one decision in a given situation. This, however, comes with several limitations. First, single observations offer less reliable estimates of stable behavioural preferences as compared to multiple observations (Epstein, 1983). Second, observing only one decision allows for inferences regarding the importance of only one norm. For instance, if a participant gives half

of the stake to their partner, we may deduce they are concerned with an equality norm. However, we cannot deduce anything about how this participant considers generosity (e.g., giving more than half), and whether they consider it less important than equality. Third, single-shot games do not reveal how people's choices may change upon learning contextual information regarding the social interaction (Camerer & Thaler, 1995). Contextual factors, such as existing relationships between moral actors (Simpson et al., 2016), or their deservingness of monetary compensation or reward (Feather, 1999), may promote reliance on different context-dependent norms, which although common in everyday life, are understudied in the economic games literature. Finally, most previous studies have focused on costly sharing, which may reflect economic concerns in addition to moral concerns. Indeed, costless and costly sharing appear to have slightly different personality correlates (Ferguson et al., 2019). One way to surpass these limits of traditional economic games is to assess third-party moral judgements across a broad range of observed sharing behaviours occurring in variations of a relevant situation. Patterns of moral endorsement and condemnation can then be attributed to individual differences in concern for moral norms across contextual conditions, without the confound of concern for economic gain.

Estimating Fairness Norm Profiles Using a Novel Paradigm

We recently developed a paradigm to characterize individual differences in the importance assigned to different fairness norms, while overcoming the abovementioned limitations of traditional economic games (Andrejević et al., 2019). Here, participants made moral judgements regarding the sharing actions of virtual others engaged in a variant of the Dictator Game (see Figure 1). Participants first made an initial, 'context-absent' judgement of a Dictator's offer (henceforth called "Decision-maker") to their partner (called "Receiver") (ranging between 0-10 dollars). Subsequently, participants made a second judgement of the same offer after receiving contextual information regarding how much that partner had

previously offered to another person ('context-present' judgement). Participants' judgements were coherent across trials, and the patterns of judgements across the range of offers (0-10) could be well captured by smooth spline functions. For example, judgements of some participants were strongly negative for low offers (\$0-3), relatively positive for mid-range offers (\$4-6) and strongly positive for high offers (\$6-10), and this pattern was well captured by an s-shaped curve. Crucially, the shape of the curve varied markedly across individuals. Dominant modes of variation across individuals were identified using functional Principle Component Analysis (fPCA) (Ramsay et al., 2009; Ramsay & Silverman, 2005), and were interpretable in relation to various context-independent and context-dependent norms. Individuals' principle component (PC) scores were interpreted as estimates of the importance that each participant assigned to each norm. For example, scores on one PC captured how strongly a participant endorsed generous sharing (i.e., giving more than 50% of the stake to their partner).

Consistent with previous studies using traditional economic games, we found pronounced individual differences in the importance people assigned to several distinct fairness norms (Andrejević et al., 2019). In context-absent judgements, individuals differed in how strongly they endorsed high offers, how lenient they were in judging low offers, and how strongly they endorsed equal offers, reflecting differences in the importance placed on generosity, selfishness, and equality norms, respectively. Moreover, in context-present judgements individuals differed in how strongly they endorsed *relatively* higher offers made by the Decision-maker compared to those previously made by the Receiver, how leniently they judged *relatively* lower offers, and how strongly they endorsed similar offers, reflecting differences in the importance placed on relative generosity, relative selfishness, and indirect reciprocity norms. These components captured most of the variability in judgement patterns (93.8% for context-absent and 91.2% for context-present judgements). Therefore, a set of six

component scores comprehensively describes judgement patterns of an individual and profiles how much importance an individual assigns to relevant fairness norms. These fairness norm profiles provide a rich and nuanced description of individual differences in preferences regarding distributive justice. What remains unknown is how these fairness norm profiles relate to basic personality traits.

The Present Study

In the present study we re-analysed data from our moral judgement paradigm to examine how fairness norm profiles map onto basic personality traits. This enabled us to answer several questions: First, what are the personality correlates of fairness norm profiles, and do these match previous findings based on traditional economic games? Based on recent reviews of the literature (Thielmann et al., 2020; Zhao & Smillie, 2015) we expected personality correlates of fairness norm profiles to include Big Five Agreeableness and its facets. Second, are traits beyond Agreeableness that have not been previously linked with behaviour in one-shot games associated with fairness norm profiles? Third, which level of the personality trait hierarchy best captures individual differences in fairness concerns? Previous research has discussed relationships between fairness-related behaviours and personality at various levels (Hilbig et al., 2014; Thielmann et al., 2020; Zhao et al., 2017), but has not formally tested which level best captures these relationships. Fourth, are these relations consistent across context-independent and context-dependent norms? A clearer picture of these associations would improve our understanding of how robust the relationships between fairness norms and personality are across contexts. To address these questions we examined how fairness norm profiles characterized in Andrejević et al. (2019) relate to personality dimensions at both the (broader) domain level and the (narrower) facet level of the Big Five, based on personality questionnaire data acquired from the same participants that was not reported in our previous publication¹.

Figure 1. Moral judgement paradigm. **(a)** Illustration of the cover story presented to participants before the task about a fictitious experiment involving two rounds. In Round 1, pairs of individuals were randomly assigned the roles of a ‘Decision-maker’, and a ‘Receiver’. Person A (in the role of a Decision-maker) was allocated 10 dollars and decided how much to share with Person B (in the role of a Receiver). In Round 2, Person A was assigned the role of a Receiver and paired with a new Decision-maker partner - Person C. Person C was allocated 10 dollars and decided how much to share with Person A. Importantly, Person C was shown the amount that Person A had shared in the previous round (\$x). Person C decided to share a \$y amount, and this sharing behaviour was judged in the real experiment. **(b)** Moral judgement task. Each trial of the task began with a fixation cross, after which Participants were presented the amount that the Decision-maker (Person C) shared with the Receiver (Person A) in Round 2 (\$y). However, at this point participants were not informed of the amount Receiver had shared with another person in Round 1 (\$x). Using their mouse, participants indicated their moral judgement of the Decision-maker on a grey bar

scale ranging from “bad” to “good”. Subsequently, the contextual information regarding the deservingness of the Round 2 Receiver was revealed (i.e., the amount \$x that Receiver had shared in the previous round). Participants then indicated their moral judgement of the Decision-maker once more.

Methods

Participants

After exclusions (see Supplements 2), the sample comprised 313 participants (222 female, 91 male, $M_{age} = 20.66$, $SD = 2.51$, range: 18-36 years). The sample size was determined before we planned the current analyses, to suit the hypothesis-testing approach reported in Andrejevic et al. (2019). Nevertheless, this sample size meets recommendations for latent variable analyses (e.g., MacCallum et al., 1999). Participants were drawn from an undergraduate psychology program at a large Australian university and received course credit in exchange for their time. The study was approved by the Human Research Ethics Committee of the Melbourne School of Psychological Sciences (Ethics ID 1750046).

Personality Measures

Personality traits were assessed using the Big Five Inventory 2 (BFI2) (Soto & John, 2016), which comprises 60 items devised to measure 15 facet traits nested within five domains. The domains include: Agreeableness (subsuming Compassion, Respectfulness, and Trust); Conscientiousness (subsuming Organization, Productiveness, and Responsibility); Extraversion (subsuming Assertiveness, Energy, and Sociability); Negative Emotionality (subsuming Anxiety, Depression, and Volatility); and Open-mindedness (subsuming Aesthetic Sensitivity, Creative Imagination, and Intellectual Curiosity). This inventory has good internal consistency (mean across domains $\alpha = .87$, and facets $\alpha = .76$), and test-retest stability within an 8 week period (mean across domains $r = .8$, and facets $r = .73$) (Soto &

John, 2016). Participants indicated their agreement on a 5-point scale with each point labelled: (1) “disagree strongly”, (2) “disagree a little”, (3) “neither agree nor disagree”, (4) “agree a little”, and (5) “agree strongly”. The order of items was randomized for each participant. (Additional measures were beyond our present scope, see Supplements 4 for full details.) Within several questionnaires we included attention-check items such as: “This is an attention check, please indicate strong agreement”.

Experimental Paradigm

The experimental procedures are reported in detail in the original publication (Andrejević et al., 2019), and in the supplementary materials (Supplements 3). In short, participants made third-party moral judgements of sharing behaviours of fictional players engaged in a variant of the dictator game, where a ‘Decision-maker’ was allocated 10 dollars and asked to choose how much to share with a ‘Receiver’ (see Figure 1). Participants first made an initial, ‘context-absent’ judgement of the Decision-maker’s offer to the Receiver. Subsequently, participants made a second judgement of the same offer after receiving contextual information regarding the Receiver’s previous offer to another person (‘context-present’ judgement). This sequence was repeated for varying combinations of Decision-maker and Receiver offers across 121 trials.

Derivation of Fairness Norm Profiles

Fairness norm profiles were derived using methods described in detail in Andrejevic et al. (2019), using functional Principle Component Analyses (fPCA) (Ramsay et al., 2009; Ramsay & Silverman, 2005). First, median scores across trials were calculated for moral judgements of each Decision-makers’ offer amount (for context-absent judgments), and for each magnitude of Decision-makers’ sharing relative to their partners’ previous sharing (for context-present judgements). Smooth spline functions were then fitted to these median judgement scores. For both context-absent and context-present judgements, the main

components of variability in these spline functions across individuals were extracted using fPCA with varimax rotation. The resulting PCs captured: (a) how strongly each participant endorsed high offers (Context-Absent Principle Component 1, henceforth abbreviated as CA-PC1), i.e. the importance of generosity norms for the individual; (b) how lenient they were in judging low offers (CA-PC2), reflecting the lack of importance of the selfishness norm; (c) how strongly they endorsed even offers (CA-PC3), reflecting the importance of equality norms; (d) how strongly they endorsed relatively higher offers (Context-Present Principle Component 1; CP-PC1), reflecting the importance of relative generosity norms; (e) how lenient they were in judging relatively lower offers (CP-PC2), reflecting the lack of importance of relative selfishness norms; and finally (f) how strongly they endorsed similar offers (CP-PC1), reflecting importance of indirect reciprocity norms. These components are depicted in Figure 5 of Andrejevic et al. (2019) and are reproduced in Supplementary Figure 1.

Data Analyses

Big Five Measurement Models

We determined personality scores by calculating mean values across items for each facet and domain within the BFI-2 inventory, as described by Soto & John (2016). In order to separate common sources of measurement noise from variables of interest and improve measurement precision, we explored several approaches to modelling these traits as latent variables, using the *Lavaan* package v0.6-5 (Rosseel, 2012) and R v3.5.0. Our main approach was a *bifactorial* modelling approach, which we used to gauge whether relationships between fairness norms are local to facets of personality or generalise to domains or higher order factors (Holzinger & Swineford, 1937). We additionally used a factor modelling approach informed by previous research (Biderman et al., 2019), the results of which approximated

model fits reported in the previous literature (analyses and results for this approach are reported in Supplements 5).

Bifactorial Modelling. First, we constructed a model in which each questionnaire item depends on one of five latent orthogonal factors common for 12 items (domain), one of fifteen latent orthogonal factors common for 4 items (facet), as well as residual measurement error. This model had a poor fit across the fit indices ($RMSEA = .053$, 90% CI [.050, .056], $CFI = .789$, $SRMR = .116$, $BIC = 51170.86$). To more fully recognise the hierarchical structure of personality traits, we also considered models that included, in addition to facets and domains, either one (Musek, 2007) or two (DeYoung et al., 2002) higher-order (supra-domain) factors. In the second version of the model we added one higher-order factor underlying all items (often described as the ‘general factor’ of personality), but this worsened the model fit ($RMSEA = .063$, 90% CI [.061, .066], $CFI = .707$, $SRMR = .100$, $BIC = 51749.133$). In the third version of the model we replaced one higher-order factor with two (often called ‘meta-traits’) — *stability* (subsuming Conscientiousness, Agreeableness and Negative Emotionality domains), and *plasticity* (subsuming Extraversion and Openness domains) (see DeYoung, 2006). The fit improved (as compared to the previous two models) across all indices ($RMSEA = .047$, 90% CI [.044, .051], $CFI = .837$, $SRMR = .107$, $BIC = 51094.192$). While still falling short of the standards of what is formally considered a good fit, this is not unusual for broad multiscale personality measures (Hopwood & Donnellan, 2010; Marsh et al., 2010). Since this model outperformed all the other theoretically plausible models (see Supplements 5), it reflected the best representation of the data structure (henceforth called the *Bifactorial Model*), and factor scores were extracted at the level of facets, domains, and meta-traits.

Correlations Between Personality Traits and Fairness Norm Profiles

To examine how basic personality traits may relate to importance of fairness norms we correlated the PC scores (i.e., norm profiles) with each personality trait estimate for two measurement models (Mean Traits and Bifactorial Model scores) using non-parametric Spearman's rank-order correlation coefficients. These were preferable to Pearson correlations because PC scores were not normally distributed, and also because rank-order correlations are less susceptible to the influence of outliers (de Winter et al., 2016). Since we did not have strong theoretical predictions for these correlations, we did not interpret p-values, but rather focused on effect sizes (as recommended by Szucs & Ioannidis, 2017), only taking notice of effects larger than what is considered small in individual-differences research (correlation coefficient $r > .10$, Gignac & Szodorai, 2016). Due to the number of correlations computed, some imprecision around the correlation estimates is likely, and we were careful not to over-interpret single values. For this reason, we focussed on personality traits that correlated stronger than $r > .10$ with multiple PCs, which gave us confidence that these may be related to a significant degree with the interrelated pattern of fairness norms.

Results

Preliminary Statistics

Fairness Norm Profiles. Descriptive statistics and intercorrelations between different PC scores (as reported in Andrejević et al., 2019) are presented in Table 1. There were positive associations between pairs of components reflecting context-absent and context-present norm pairs such as generosity and relative generosity, selfishness and relative selfishness, and equality and indirect reciprocity. These results indicate coherence in judgement patterns across contexts (for further discussion see Andrejević et al., 2019).

Table 1: Descriptive Statistics, and Intercorrelations of the Fairness Norm Profile Principle Components

Fairness Norm	Descriptives		Intercorrelations				
	Median	SD	CA-PC1	CA-PC2	CA-PC3	CP-PC1	CP-PC2
Context-absent judgement of:							
Generosity (CA-PC1)	23.00	75.04	-				
Selfishness (CA-PC2)	-23.50	70.50	-0.66	-			
Equality (CA-PC3)	-6.71	34.59	0.33	0.02	-		
Context-present judgement of:							
Relative generosity (CP-PC1)	111.35	219.36	0.46	-0.29	0.07	-	
Relative selfishness (CP-PC2)	-21.95	77.99	-0.42	0.56	0.11	-0.62	-
Indirect reciprocity (CP-PC3)	-11.21	59.29	0.10	0.10	0.47	-0.01	0.10

Note. For intercorrelations, cell colour intensity scales with the strength of the association and ranges

from red (negative correlation) and green (positive correlation), to white (zero correlation). The darkest colour is anchored to the strongest correlation in the table. For principle component score means, it is important to note that, although higher numbers indicate stronger moral endorsement, with midpoint judgement (neither good or bad) referenced at 0, the range of these scores is somewhat broader than the response scale used by participants because of the mathematical transformations that occur within functional analyses.

Basic Personality Traits. Descriptive statistics and intercorrelations between different domains and between facets were in line with previous results (Soto & John, 2016; presented in Table 2). The internal reliability of the BFI2 inventory in our final sample was good (mean Alpha across domains $\alpha = .84$, and across facets $\alpha = .71$) and similar to reliability estimates reported in the validation study (Soto & John, 2016).

Table 2. Descriptive Statistics and Intercorrelations of the BFI-2 Domains (above the diagonal) and Facets (below the diagonal).

			Intercorrelations													
	Descriptives		Agreeableness			Conscientiousness			Extraversion			Negative Emotionality			Openness	
Facet	Mean	SD	Com.	Res.	Tru.	Org.	Pro.	Res.	Ass.	Ene.	Soc.	Anx.	Dep.	Vol.	Aes.	Cre.
Agreeableness	3.71	0.55		-			0.35			0.14		-0.24			0.13	
Compassion	3.78	0.72	-													
Respectfulness	3.99	0.66	0.40	-												
Trust	3.37	0.76	0.36	0.40	-											
Conscientiousness	3.30	0.68					-			0.28		-0.26			0.10	
Organization	3.43	0.94	0.13	0.20	0.15	-										
Productiveness	3.05	0.83	0.26	0.16	0.18	0.59	-									
Responsibility	3.41	0.71	0.31	0.43	0.26	0.43	0.54	-								
Extraversion	3.24	0.73								-		-0.28			0.33	
Assertiveness	3.15	0.85	0.07	-0.17	0.01	0.13	0.34	0.20	-							
Energy	3.51	0.80	0.26	0.05	0.31	0.16	0.36	0.25	0.45	-						
Sociability	3.07	0.97	0.15	-0.07	0.16	0.02	0.19	0.15	0.55	0.61	-					
Negative Emotionality	3.01	0.74											-			-0.04
Anxiety	3.41	0.87	-0.04	-0.10	-0.27	-0.06	-0.17	-0.19	-0.17	-0.25	-0.25	-				
Depression	2.68	0.85	-0.09	-0.12	-0.28	-0.13	-0.28	-0.26	-0.23	-0.44	-0.32	0.60	-			
Volatility	2.94	0.93	-0.01	-0.20	-0.26	-0.16	-0.19	-0.25	0.04	-0.15	-0.05	0.52	0.57	-		
Openness	3.80	0.62														-
Aesthetic Sensitivity	3.76	0.83	0.23	0.06	0.10	0.06	0.09	0.07	0.15	0.17	0.16	-0.02	0.03	-0.01	-	
Creative Imagination	3.66	0.75	0.12	0.00	0.07	-0.02	0.18	0.10	0.28	0.31	0.20	-0.15	-0.11	-0.03	0.51	-
Intellectual Curiosity	3.98	0.69	0.14	-0.04	0.01	-0.01	0.10	0.08	0.37	0.25	0.18	0.04	-0.08	0.06	0.46	0.53

Note. Cell colour intensity scales with the strength of the association and ranges from red (negative correlation) and green (positive correlation), to white (zero correlation). The darkest colour is anchored to the strongest correlation in the table. Coefficients for relationships between facets subsumed within the same domain are bolded. Com.= Compassion; Res.= Respectfulness; Tru.= Trust; Org.= Organization; Pro.= Productiveness; Respo.= Responsibility; Ass.= Assertiveness; Ene.= Energy; Soc.= Sociability; Anx.= Anxiety; Dep.= Depression; Vol.= Volatility; Aes.= Aesthetic Sensitivity; Cre.= Creative Imagination.

Correlations Between Personality and Norm Profiles

Mean Trait Scores. Table 3 depicts correlations between personality trait scores and fairness norm profiles. Correlations were most pronounced for PCs capturing variability in judgements of low and relatively low offers. Specifically, these PCs were most strongly correlated with the domain level Agreeableness ($r_{CA-PC2} = -0.22$ and $r_{CP-PC2} = -0.17$), Extraversion ($r_{CA-PC2} = -0.16$ and $r_{CP-PC2} = -0.19$), and Conscientiousness ($r_{CA-PC2} = -0.15$ and $r_{CP-PC2} = -0.15$). PCs capturing variability in judgements of high offers correlated with these same domains, albeit more modestly (Agreeableness $r_{CA-PC1} = 0.10$ and $r_{CP-PC1} = 0.07$; Extraversion $r_{CA-PC1} = 0.14$ and $r_{CP-PC1} = 0.14$; Conscientiousness $r_{CA-PC1} = 0.11$ and $r_{CP-PC1} = 0.10$). Concerning the remaining traits: The Openness domain correlated with judgements of *relatively* higher and lower offers ($r_{CP-PC1} = .11$ and $r_{CP-PC2} = -.14$) but not context-absent judgements of low and high offers ($r_{CA-PC2} = .03$, and $r_{CA-PC1} = .08$). The Negative Emotionality domain was only weakly correlated with fairness norm profiles ($|r| < .10$). Relationships between personality and fairness norms observed at the domain level were also strong for some of the facets contributing to each factor (e.g., Compassion, Responsibility and Energy facets; see Table 3).

Table 3. Associations between mean personality traits and principle component scores for context-absent and context-present judgements.

	Context-absent judgement of:			Context-present judgement of relatively:		
	high offers	low offers	equal offers	higher offers	lower offers	similar offers
	(CA-PC1)	(CA-PC2)	(CA-PC3)	(CP-PC1)	(CP-PC2)	(CP-PC3)
Agreeableness	0.10 [-0.01, 0.21]	-0.22 [-0.32, -0.10]	-0.01 [-0.13, 0.11]	0.07 [-0.04, 0.18]	-0.17 [-0.27, -0.05]	-0.05 [-0.16, 0.06]
Compassion	0.14 [0.02, 0.25]	-0.20 [-0.31, -0.09]	-0.01 [-0.13, 0.11]	0.09 [-0.02, 0.20]	-0.19 [-0.29, -0.08]	-0.04 [-0.15, 0.07]
Respectfulness	0.02 [-0.09, 0.14]	-0.11 [-0.22, 0.01]	-0.05 [-0.17, 0.07]	0.01 [-0.11, 0.12]	-0.09 [-0.20, 0.03]	-0.03 [-0.15, 0.07]
Trust	0.05 [-0.06, 0.16]	-0.17 [-0.27, -0.06]	0.00 [-0.11, 0.11]	0.07 [-0.03, 0.17]	-0.10 [-0.21, 0.01]	-0.05 [-0.16, 0.06]
Conscientiousness	0.11 [0.00, 0.22]	-0.15 [-0.26, -0.03]	0.01 [-0.10, 0.13]	0.10 [-0.01, 0.22]	-0.15 [-0.26, -0.04]	0.06 [-0.05, 0.17]
Organization	0.04 [-0.07, 0.15]	-0.06 [-0.17, 0.05]	0.02 [-0.09, 0.14]	0.07 [-0.04, 0.18]	-0.04 [-0.15, 0.07]	0.06 [-0.06, 0.17]
Productiveness	0.09 [-0.03, 0.20]	-0.14 [-0.25, -0.03]	-0.02 [-0.13, 0.09]	0.08 [-0.04, 0.19]	-0.16 [-0.27, -0.05]	0.05 [-0.06, 0.15]
Responsibility	0.17 [0.06, 0.29]	-0.19 [-0.30, -0.08]	0.01 [-0.09, 0.12]	0.11 [-0.01, 0.22]	-0.20 [-0.30, -0.09]	0.05 [-0.06, 0.16]
Extraversion	0.14 [0.02, 0.26]	-0.16 [-0.27, -0.04]	-0.01 [-0.12, 0.11]	0.14 [0.02, 0.25]	-0.19 [-0.30, -0.08]	0.01 [-0.10, 0.11]
Assertiveness	0.06 [-0.06, 0.18]	-0.06 [-0.17, 0.05]	-0.01 [-0.13, 0.11]	0.09 [-0.03, 0.20]	-0.09 [-0.19, 0.02]	-0.03 [-0.13, 0.08]
Energy	0.14 [0.02, 0.26]	-0.17 [-0.28, -0.06]	0.01 [-0.11, 0.12]	0.17 [0.06, 0.27]	-0.19 [-0.29, -0.08]	0.04 [-0.07, 0.15]
Sociability	0.11 [0.00, 0.23]	-0.14 [-0.25, -0.03]	-0.02 [-0.13, 0.10]	0.10 [-0.01, 0.21]	-0.17 [-0.28, -0.07]	0.00 [-0.10, 0.11]
Negative Emotionality	-0.09 [-0.20, 0.02]	0.09 [-0.02, 0.20]	-0.07 [-0.17, 0.04]	-0.03 [-0.15, 0.08]	0.06 [-0.05, 0.17]	-0.02 [-0.13, 0.09]
Anxiety	-0.10 [-0.21, 0.01]	0.08 [-0.04, 0.19]	-0.07 [-0.18, 0.03]	-0.01 [-0.12, 0.10]	0.04 [-0.07, 0.15]	-0.04 [-0.15, 0.07]
Depression	-0.11 [-0.23, 0.00]	0.08 [-0.03, 0.19]	-0.07 [-0.17, 0.03]	-0.07 [-0.18, 0.05]	0.10 [-0.01, 0.21]	-0.03 [-0.14, 0.08]
Volatility	-0.04 [-0.16, 0.07]	0.09 [-0.02, 0.20]	-0.01 [-0.12, 0.10]	-0.02 [-0.13, 0.10]	0.03 [-0.07, 0.14]	0.01 [-0.10, 0.12]
Openness	0.03 [-0.09, 0.14]	-0.08 [-0.19, 0.03]	0.05 [-0.07, 0.16]	0.11 [0.00, 0.23]	-0.14 [-0.25, -0.02]	0.02 [-0.10, 0.13]
Aesthetic Sensitivity	0.00 [-0.11, 0.11]	-0.05 [-0.16, 0.06]	0.06 [-0.05, 0.18]	0.06 [-0.05, 0.17]	-0.09 [-0.20, 0.01]	0.00 [-0.11, 0.11]
Creative Imagination	0.02 [-0.10, 0.13]	-0.10 [-0.20, 0.01]	0.05 [-0.06, 0.16]	0.13 [0.02, 0.25]	-0.15 [-0.26, -0.03]	0.06 [-0.06, 0.17]
Intellectual Curiosity	0.07 [-0.05, 0.19]	-0.06 [-0.17, 0.06]	0.01 [-0.10, 0.13]	0.07 [-0.05, 0.18]	-0.10 [-0.21, 0.02]	0.01 [-0.11, 0.12]

Note. Spearman's rank order correlation coefficients (r) are shown along with 95%

Confidence Intervals (in brackets). Cell colour intensity scales with the strength of the association and ranges from red (negative correlation) and green (positive correlation), to

white (zero correlation). The darkest colour is anchored to the strongest correlation in the table. Coefficients with $p < 0.05$ (two-tailed) are bolded, however, note that no correction for multiple tests was performed.

Bifactorial Model. Many of the above presented correlations between mean trait scores and fairness profiles were equally strong for factor and facet level estimates (e.g., in Table 3, Extraversion vs. Energy), making it difficult to assess at what level of the personality trait hierarchy (e.g., facets vs. domains vs. meta-traits) the observed relationships were best captured. Here the *Bifactorial Model* is valuable in that it provides estimates of domains that are orthogonal to facets, allowing us to compare the relative importance of facets and domains (see Table 4). Within this model, correlations between domain-level coefficients and fairness norm profiles differed very little from those of mean trait scores ($|\Delta r| < .03$). Crucially, in contrast to these stable domain-level correlation coefficients, facet-level coefficients dropped substantially—most of them to below $|r| < .10$ —indicating that in most cases the relationships between personality and fairness norm profiles were best captured at the domain level. This was further reinforced by the relatively weak correlations between the two higher-order meta-traits (Stability and Plasticity) and fairness norm measures ($|r| < .08$). These results indicate that correlations between personality and fairness norms were specific to the domains rather than meta-traits and facets.

Table 4. Associations between *Bifactorial Model* estimates of personality and principle component scores for context-absent and context-present judgements.

	Context-absent judgement of:			Context-present judgement of relative:		
	high offers	low offers	equal offers	higher offers	lower offers	similar offers
	(CA-PC1)	(CA-PC2)	(CA-PC3)	(CP-PC1)	(CP-PC2)	(CP-PC3)
Agreeableness	0.12 [0.00, 0.23]	-0.20 [-0.31, -0.09]	-0.01 [-0.13, 0.11]	0.07 [-0.04, 0.19]	-0.16 [-0.27, -0.05]	-0.03 [-0.14, 0.08]
Compassion	0.05 [-0.06, 0.15]	-0.07 [-0.18, 0.04]	0.00 [-0.12, 0.10]	0.05 [-0.06, 0.16]	-0.12 [-0.23, -0.02]	-0.06 [-0.17, 0.06]
Respectfulness	0.04 [-0.08, 0.15]	-0.01 [-0.13, 0.10]	-0.03 [-0.15, 0.08]	0.04 [-0.09, 0.16]	-0.04 [-0.16, 0.08]	-0.02 [-0.14, 0.10]
Trust	-0.01 [-0.12, 0.09]	-0.05 [-0.16, 0.05]	0.02 [-0.08, 0.13]	0.07 [-0.04, 0.18]	-0.03 [-0.14, 0.08]	-0.01 [-0.13, 0.09]
Conscientiousness	0.11 [-0.01, 0.21]	-0.15 [-0.26, -0.04]	0.01 [-0.11, 0.12]	0.10 [-0.01, 0.20]	-0.16 [-0.26, -0.05]	0.06 [-0.05, 0.17]
Organization	-0.06 [-0.17, 0.05]	0.08 [-0.03, 0.18]	0.00 [-0.11, 0.11]	0.03 [-0.08, 0.15]	0.08 [-0.04, 0.18]	0.02 [-0.09, 0.13]
Productiveness	-0.04 [-0.16, 0.08]	-0.01 [-0.13, 0.10]	0.02 [-0.10, 0.13]	0.00 [-0.11, 0.12]	-0.04 [-0.15, 0.08]	-0.04 [-0.16, 0.08]
Responsibility	0.07 [-0.04, 0.18]	-0.08 [-0.19, 0.02]	-0.02 [-0.14, 0.09]	-0.01 [-0.12, 0.10]	-0.06 [-0.16, 0.05]	0.01 [-0.10, 0.12]
Extraversion	0.13 [0.01, 0.24]	-0.16 [-0.26, -0.04]	-0.01 [-0.12, 0.10]	0.11 [0.00, 0.21]	-0.17 [-0.27, -0.06]	0.00 [-0.11, 0.11]
Assertiveness	-0.02 [-0.12, 0.09]	0.02 [-0.09, 0.12]	0.00 [-0.11, 0.11]	0.04 [-0.07, 0.15]	0.02 [-0.09, 0.12]	0.02 [-0.09, 0.13]
Energy	0.04 [-0.07, 0.15]	-0.05 [-0.16, 0.05]	0.06 [-0.04, 0.17]	0.08 [-0.03, 0.19]	-0.06 [-0.17, 0.04]	0.08 [-0.03, 0.19]
Sociability	0.04 [-0.07, 0.15]	0.05 [-0.06, 0.16]	0.08 [-0.03, 0.19]	-0.04 [-0.15, 0.07]	0.05 [-0.07, 0.17]	0.10 [0.00, 0.21]
Negative Emotionality	-0.09 [-0.21, 0.02]	0.08 [-0.04, 0.19]	-0.09 [-0.20, 0.02]	-0.04 [-0.16, 0.07]	0.07 [-0.04, 0.18]	-0.04 [-0.14, 0.07]
Anxiety	-0.07 [-0.18, 0.04]	0.02 [-0.09, 0.13]	0.00 [-0.11, 0.11]	0.02 [-0.10, 0.13]	0.03 [-0.08, 0.14]	0.00 [-0.12, 0.11]
Depression	-0.08 [-0.19, 0.04]	0.04 [-0.07, 0.15]	0.02 [-0.09, 0.13]	-0.06 [-0.18, 0.05]	0.08 [-0.03, 0.19]	-0.01 [-0.12, 0.11]
Volatility	0.02 [-0.10, 0.13]	0.03 [-0.08, 0.14]	0.04 [-0.07, 0.14]	-0.02 [-0.12, 0.10]	-0.01 [-0.11, 0.10]	0.02 [-0.08, 0.13]
Openness	0.03 [-0.08, 0.14]	-0.11 [-0.22, 0.00]	0.09 [-0.02, 0.20]	0.12 [0.00, 0.23]	-0.15 [-0.26, -0.04]	0.04 [-0.08, 0.15]
Aesthetic Sensitivity	0.02 [-0.09, 0.13]	0.03 [-0.08, 0.14]	0.01 [-0.10, 0.12]	-0.01 [-0.12, 0.10]	0.01 [-0.09, 0.11]	-0.09 [-0.20, 0.02]
Creative Imagination	-0.07 [-0.18, 0.05]	-0.04 [-0.15, 0.07]	0.00 [-0.10, 0.11]	0.05 [-0.06, 0.16]	0.00 [-0.10, 0.11]	0.06 [-0.06, 0.16]
Intellectual Curiosity	0.17 [0.06, 0.27]	-0.10 [-0.20, 0.00]	0.03 [-0.08, 0.13]	0.06 [-0.06, 0.17]	-0.03 [-0.14, 0.08]	-0.03 [-0.14, 0.08]
Stability	0.01 [-0.11, 0.13]	0.07 [-0.05, 0.19]	0.02 [-0.10, 0.14]	0.01 [-0.11, 0.11]	0.03 [-0.08, 0.14]	0.03 [-0.08, 0.14]
Plasticity	0.02 [-0.10, 0.14]	-0.01 [-0.12, 0.11]	-0.01 [-0.13, 0.11]	0.04 [-0.08, 0.15]	-0.06 [-0.16, 0.06]	0.01 [-0.10, 0.11]

Note. Spearman's rank order correlation coefficients (r) are shown along with 95% Confidence Intervals (in brackets). Cell colour intensity scales with the strength of the association and ranges from red (negative correlation) and green (positive correlation), to white (zero correlation). The darkest colour is anchored to the strongest correlation in the table. Coefficients with $p < 0.05$ (two-tailed) are bolded, however, note that no correction for multiple tests was performed.

Discussion

We investigated how basic dimensions of personality relate to individual differences in moral judgments. We examined correlations between personality traits measured using the BFI2 inventory and fairness norm profiles derived from a multi-trial third-party moral judgement task. Trait scores for Agreeableness, Conscientiousness, Openness, and Extraversion correlated with individual fairness norm profiles across several offer ranges, which can be interpreted as positive relationships between these domains and the importance participants ascribed to generosity, selfishness, relative generosity, and relative selfishness norms in moral judgements. Within our bifactorial model these correlations were strongest for the domain level of personality, suggesting that these relationships are best described in reference to personality domains rather than facets or meta-traits.

Positive correlations between Agreeableness and the importance of fairness norms are consistent with previous work that investigated personality correlates of prosocial behaviour within traditional economic games (Thielmann et al., 2020; Zhao & Smillie, 2015). Whereas previous research has demonstrated this relationship in first-person choices, our findings show that it generalizes to moral judgements of impartial observers. We also found this pattern of associations for both context-independent and context-dependent selfishness and generosity norms, suggesting that links between Agreeableness and fairness preferences may be reasonably robust across contexts with and without deservingness information.

Our findings also provide new insights regarding the scope and specificity of relationships between personality and moral norms. Several other traits beyond Agreeableness, including Conscientiousness, Openness, and Extraversion, positively correlated with the importance placed on selfishness and generosity. Positive correlations between these traits and prosocial behaviours have been reported for several economic games, and most often for game versions in which the instructions or the game-structure (i.e.

the context surrounding the social interaction) have been altered in various ways (Brocklebank et al., 2011; Clark et al., 2014; Hirsh & Peterson, 2009; Lönnqvist et al., 2011; Zhao & Smillie, 2015); however, these relationships are not consistent across games (Thielmann et al., 2020). There are several possible accounts for our results. For instance, Openness is related to sophistication and impartiality in moral reasoning (Cawley et al., 2000; De Raad & Van Oudenhoven, 2011), which may confer more confident understanding of moral norms and stronger judgements (resulting in higher PC scores). Committing to strong moral judgements may also require social confidence, as is characteristic of people who are assertive and bold, which is an aspect of Extraversion. Alternatively, our Extraversion results may also reflect the affiliative tendencies of Extraversion. Affiliative tendencies are characterized by sensitivity to social reinforcement (DeYoung et al., 2013), which may play an important role in how moral norms are learned, and increase aversion to norm violations because of potential social repercussions. A relationship between affiliation and importance assigned to fairness norms is not typically observed in economic games, because other Extraversion tendencies, especially agency, may positively facilitate the maximization of profit, masking a relationship between affiliation and concern for fairness norms (Zhao & Smillie, 2015). This relationship may be more readily expressed in tasks which do not provide opportunities for participants to maximize profit, such as our task. Committing to strong moral judgements may also rely on intuitions regarding the moral responsibilities of agents in economic games. Conscientious individuals tend to follow moral rules more strictly (C. M. Berry et al., 2007; Cohen et al., 2014; Marcus et al., 2007), and thus may also judge others more strictly. Alternatively, our Conscientiousness findings may also reflect diligence in making judgements over many trials. Over repeated measures undiligent individuals may be more prone to making erroneous judgements (K. Berry et al., 2019), which may affect the

median scores calculated across trials. Of course, these suggestions are somewhat speculative, but provide potentially interesting hypotheses for future research.

We found that correlations between norm profiles and facet-level traits dropped substantially in the bifactorial model as compared to traits estimated by computing means across items. Moreover, we found correlations between norm profiles and higher-order meta-traits to be weak. These results suggest that heterogeneity in moral norms is best captured at the domain level. Although relationships between fairness-related behaviours and personality have been investigated at various levels (Hilbig et al., 2014; Thielmann et al., 2020; Zhao et al., 2017), our study is the first to use bifactorial models to formally test which of these levels best captures these relationships. Our findings suggest that facet-level traits do not add to our understanding of relationships between fairness preferences and personality (as compared to domain-level traits).

Finally, our findings also allow us to comment on whether relationships between personality and importance assigned to fairness norms are context-specific or generalise across contexts with and without additional deservingness information. Correlations between fairness profiles and personality were strongest for generosity and selfishness norms, and were consistent across scores for context-independent generosity and context-dependent relative generosity, and across scores for context-independent selfishness and context-dependent relative selfishness (although see the previous paragraph where we discuss some subtle differences). This indicates that relations between personality and norm profiles are robust across contexts with and without deservingness information. This is an important reassurance given that subtle manipulations of contextual information in economic game tasks can substantially alter observed personality correlates of fairness-related behaviours (Zhao et al., 2017, 2018). There is even a concern that the classical Dictator game may be so dependent on artificial contextual cues (e.g., random assignment of partners and

unavailability of deservingness qualifiers) that it may not provide adequate insight into personality correlates of moral norms in naturalistic settings (Winking & Mizer, 2013). Our findings that personality correlates are consistent across judgements with and without contextual deservingness information alleviate this concern for our moral judgement task.

Strengths, Limitations, and Directions for Future Research

Our results highlight the strength of our novel methodological approach and demonstrate the benefits of using a multi-trial judgement task and fPCA analyses. The congruence of our Agreeableness findings with the previous literature confirms the validity of our paradigm. In fact, our correlations (.16 and .20) are larger than the meta-analytic correlations between sharing and Agreeableness (ranging between .07 and .16), which may be because our estimates of importance assigned to fairness norms may be more accurate than estimates in single-shot decision paradigms. This may also explain why we detected relations between several other traits and fairness profiles, when similar associations in previous work have been more fragmented (Zhao & Smillie, 2015). As we did not specifically predict each of these associations a priori and our methodological approach is novel, it would be valuable for future research to replicate our findings using alternative stimuli and measures. This would help confirm the reproducibility and generalisability of our findings, and investigate whether these relationships are specific to fairness norms as observed in third-party moral judgements, or more broadly applicable to fairness norms guiding prosocial and cooperative behaviours.

On the other hand, there are several limitations to our study that should be noted. First, some indices of our bifactorial model indicated that the fit was not optimal. However, these fit indices were still an improvement on the factor model fit (see Hopwood & Donnellan, 2010, for discussion on poor fit in complex multi-scale inventories), and since we were concerned with robust measurement rather than model evaluation, this issue should not

impact the interpretability of our analyses. Future research might consider revisions to the BFI-2 in an effort to improve model fit. Moreover, our findings are consistent across different measurement models, so it is highly unlikely that any of our findings are modelling artifacts. Second, the absence of correlations between equality-based norms and personality does not necessarily mean that there is no relationship between importance assigned to equality and personality. Participants exhibited much smaller individual differences in the importance they ascribed to equality and indirect reciprocity (only 9.5% and 5.6% of the variability across individuals) than for other norms. These subtle differences in judgement may require a much larger sample to be detected. Future studies could investigate these relationships in a more focused judgement task that presents examples of behaviours adhering to equality norms.

Conclusion

To conclude, our novel paradigm provided precise and context-sensitive estimates of norm profiles underlying distributive justice judgments, and our findings highlight the rich connections between personality and fairness norms. We found that Agreeableness, Extraversion, Conscientiousness and Openness related to context-independent and context-dependent norms, and that these relationships were best captured at the domain-level. Future studies may modify our paradigm to study individual differences in other aspects of morality (e.g., harm or authority) and engage participants from multiple perspectives (e.g., as first-party or third-party).

Acknowledgements

We thank Kun Zhao and Timothy Bainbridge for helpful discussions.

Conflicting Interests

The authors declare no conflicting interests.

Funding

This research was supported by an Australian Research Council grant (ARC DP160103353) to S.B.

Data Availability

Data and analyses scripts are available in the Open Science Framework repository, DOI 10.17605/OSF.IO/27HUQ.

Notes

1. Andrejević et al. (2019) investigated a different set of questions to the current study, which is why we chose to report the personality data separately.

References

- Andrejević, M., Feuerriegel, D., Turner, W., Laham, S., & Bode, S. (2019). *Moral judgements of fairness-related actions are flexibly updated to account for contextual information*. PsyArXiv. <https://doi.org/10.31234/osf.io/mkfe9>
- Berry, C. M., Ones, D. S., & Sackett, P. R. (2007). Interpersonal deviance, organizational deviance, and their common correlates: A review and meta-analysis. *Journal of Applied Psychology*, 92(2), 410–424. <https://doi.org/10.1037/0021-9010.92.2.410>
- Berry, K., Rana, R., Lockwood, A., Fletcher, L., & Pratt, D. (2019). Factors associated with inattentive responding in online survey research. *Personality and Individual Differences*, 149, 157–159. <https://doi.org/10.1016/j.paid.2019.05.043>
- Biderman, M. D., McAbee, S. T., Hendy, N. T., & Chen, Z. J. (2019). Validity of evaluative factors from Big Five and HEXACO questionnaires. *Journal of Research in Personality*, 80, 84–96. <https://doi.org/10.1016/j.jrp.2019.04.010>
- Blount, S. (1995). When social outcomes aren't fair: The effect of causal attributions on preferences. *Organizational Behavior and Human Decision Processes*, 63(2), 131–144. <https://doi.org/10.1006/obhd.1995.1068>
- Brocklebank, S., Lewis, G. J., & Bates, T. C. (2011). Personality accounts for stable preferences and expectations across a range of simple games. *Personality and Individual Differences*, 51(8), 881–886. <https://doi.org/10.1016/j.paid.2011.07.007>
- Bulmer, M., Böhnke, J. R., & Lewis, G. J. (2017). Predicting moral sentiment towards physician-assisted suicide: The role of religion, conservatism, authoritarianism, and Big Five personality. *Personality and Individual Differences*, 105, 244–251. <https://doi.org/10.1016/j.paid.2016.09.034>
- Camerer, C. F. (2003a). *Behavioral game theory: Experiments in strategic interaction*. Princeton University Press.

- Camerer, C. F. (2003b). Behavioural studies of strategic thinking in games. *Trends in Cognitive Sciences*, 7(5), 225–231. [https://doi.org/10.1016/S1364-6613\(03\)00094-9](https://doi.org/10.1016/S1364-6613(03)00094-9)
- Camerer, C. F., & Thaler, R. H. (1995). Anomalies: Ultimatums, dictators and manners. *Journal of Economic Perspectives*, 9(2), 209–219. <https://doi.org/10.1257/jep.9.2.209>
- Cawley, M. J., Martin, J. E., & Johnson, J. A. (2000). A virtues approach to personality. *Personality and Individual Differences*, 28(5), 997–1013. [https://doi.org/10.1016/S0191-8869\(99\)00207-X](https://doi.org/10.1016/S0191-8869(99)00207-X)
- Clark, C. B., Thorne, C., Vann, J., & Cropsey, K. (2014). Five-factor personality and cooperative behavior. *North American Journal of Psychology*, 16(3), 481.
- Cohen, T. R., Panter, A. T., Turan, N., Morse, L., & Kim, Y. (2014). Moral character in the workplace. *Journal of Personality and Social Psychology*, 107(5), 943–963. <https://doi.org/10.1037/a0037245>
- De Raad, B., & Van Oudenhoven, J. P. (2011). A psycholexical study of virtues in the Dutch language, and relations between virtues and personality. *European Journal of Personality*, 25(1), 43–52. <https://doi.org/10.1002/per.777>
- de Winter, J. C. F., Gosling, S. D., & Potter, J. (2016). Comparing the pearson and spearman correlation coefficients across distributions and sample sizes: A tutorial using simulations and empirical data. *Psychological Methods*, 21(3), 273–290. <https://doi.org/10.1037/met0000079>
- DeYoung, C. G., Peterson, J. B., & Higgins, D. M. (2002). Higher-order factors of the Big Five predict conformity: Are there neuroses of health? *Personality and Individual Differences*, 33(4), 533–552. [https://doi.org/10.1016/S0191-8869\(01\)00171-4](https://doi.org/10.1016/S0191-8869(01)00171-4)
- DeYoung, C. G., Weisberg, Y. J., Quilty, L. C., & Peterson, J. B. (2013). Unifying the aspects of the big five, the interpersonal circumplex, and trait affiliation. *Journal of Personality*, 81(5), 465–475. <https://doi.org/10.1111/jopy.12020>

- Engel, C. (2011). Dictator games: A meta study. *Experimental Economics*, 14(4), 583–610.
<https://doi.org/10.1007/s10683-011-9283-7>
- Epstein, S. (1983). Aggregation and beyond: Some basic issues on the prediction of behavior. *Journal of Personality*, 51(3), 360–392. <https://doi.org/10.1111/j.1467-6494.1983.tb00338.x>
- Feather, N. T. (1999). Judgments of deservingness: Studies in the psychology of justice and achievement. *Personality and Social Psychology Review*, 3(2), 86–107.
https://doi.org/10.1207/s15327957pspr0302_1
- Ferguson, E., Zhao, K., O’Carroll, R. E., & Smillie, L. D. (2019). Costless and costly prosociality: Correspondence among personality traits, economic preferences, and real-world prosociality. *Social Psychological and Personality Science*, 10(4), 461–471.
<https://doi.org/10.1177/1948550618765071>
- Forsythe, R., Horowitz, J. L., Savin, N. E., & Sefton, M. (1994). Fairness in simple bargaining experiments. *Games and Economic Behavior*, 6(3), 347–369.
<https://doi.org/10.1006/game.1994.1021>
- Gignac, G. E., & Szodorai, E. T. (2016). Effect size guidelines for individual differences researchers. *Personality and Individual Differences*, 102, 74–78.
<https://doi.org/10.1016/j.paid.2016.06.069>
- Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of Personality and Social Psychology*, 96(5), 1029–1046.
<https://doi.org/10.1037/a0015141>
- Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior & Organization*, 3(4), 367–388.
[https://doi.org/10.1016/0167-2681\(82\)90011-7](https://doi.org/10.1016/0167-2681(82)90011-7)
- Hilbig, B. E., Glöckner, A., & Zettler, I. (2014). Personality and prosocial behavior: Linking

- basic traits and social value orientations. *Journal of Personality and Social Psychology*, 107(3), 529–539. <https://doi.org/10.1037/a0036074>
- Hirsh, J. B., DeYoung, C. G., Xu, X., & Peterson, J. B. (2010). Compassionate liberals and polite conservatives: Associations of agreeableness with political ideology and moral values. *Personality and Social Psychology Bulletin*, 36(5), 655–664. <https://doi.org/10.1177/0146167210366854>
- Hirsh, J. B., & Peterson, J. B. (2009). Extraversion, neuroticism, and the prisoner's dilemma. *Personality and Individual Differences*, 46(2), 254–256. <https://doi.org/10.1016/j.paid.2008.10.006>
- Ho, A. K., Sidanius, J., Kteily, N., Sheehy-Skeffington, J., Pratto, F., Henkel, K. E., Foels, R., & Stewart, A. L. (2015). The nature of social dominance orientation: Theorizing and measuring preferences for intergroup inequality using the new SDO₇ scale. *Journal of Personality and Social Psychology*, 109(6), 1003–1028. <https://doi.org/10.1037/pspi0000033>
- Holzinger, K. J., & Swineford, F. (1937). The Bi-factor method. *Psychometrika*, 2(1), 41–54. <https://doi.org/10.1007/BF02287965>
- Hopwood, C. J., & Donnellan, M. B. (2010). How should the internal structure of personality inventories be evaluated? *Personality and Social Psychology Review*, 14(3), 332–346. <https://doi.org/10.1177/1088868310361240>
- John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed.). The Guilford Press. [https://doi.org/10.1016/S0191-8869\(97\)81000-8](https://doi.org/10.1016/S0191-8869(97)81000-8)
- Kroneisen, M., & Heck, D. W. (2020). Interindividual differences in the sensitivity for consequences, moral norms, and preferences for inaction: Relating basic personality

- traits to the CNI model. *Personality and Social Psychology Bulletin*, 46(7), 1013–1026.
<https://doi.org/10.1177/0146167219893994>
- Lee, K., & Ashton, M. C. (2018). Psychometric properties of the HEXACO-100. *Assessment*, 25(5), 543–556. <https://doi.org/10.1177/1073191116659134>
- Lewis, G. J., & Bates, T. C. (2011). From left to right: How the personality system allows basic traits to influence politics via characteristic moral adaptations. *British Journal of Psychology*, 102(3), 546–558. <https://doi.org/10.1111/j.2044-8295.2011.02016.x>
- Lipkus, I. (1991). The construction and preliminary validation of a global belief in a just world scale and the exploratory analysis of the multidimensional belief in a just world scale. *Personality and Individual Differences*, 12(11), 1171–1178.
[https://doi.org/10.1016/0191-8869\(91\)90081-L](https://doi.org/10.1016/0191-8869(91)90081-L)
- Lönnqvist, J. E., Verkasalo, M., & Walkowitz, G. (2011). It pays to pay - Big Five personality influences on co-operative behaviour in an incentivized and hypothetical prisoner's dilemma game. *Personality and Individual Differences*, 50(2), 300–304.
<https://doi.org/10.1016/j.paid.2010.10.009>
- MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, 4(1), 84–99. <https://doi.org/10.1037/1082-989X.4.1.84>
- Marcus, B., Lee, K., & Ashton, M. C. (2007). Personality dimensions explaining relationships between integrity tests and counterproductive behavior: Big Five, or one in addition? *Personnel Psychology*, 60(1), 1–34. <https://doi.org/10.1111/j.1744-6570.2007.00063.x>
- Marsh, H. W., Lüdtke, O., Muthén, B., Asparouhov, T., Morin, A. J. S., Trautwein, U., & Nagengast, B. (2010). A new look at the Big Five factor structure through exploratory structural equation modeling. *Psychological Assessment*, 22(3), 471–491.
<https://doi.org/10.1037/a0019227>

- Musek, J. (2007). A general factor of personality: Evidence for the Big One in the five-factor model. *Journal of Research in Personality*, 41(6), 1213–1233.
<https://doi.org/10.1016/j.jrp.2007.02.003>
- Peysakhovich, A., Nowak, M. A., & Rand, D. G. (2014). Humans display a “cooperative phenotype” that is domain general and temporally stable. *Nature Communications*, 5, 1–8. <https://doi.org/10.1038/ncomms5939>
- Pruitt, D. G., & Kimmel, M. J. (1977). Twenty years of experimental gaming: Critique, synthesis, and suggestions for the future. *Annual Review of Psychology*, 28(1), 363–392.
<https://doi.org/10.1146/annurev.ps.28.020177.002051>
- Ramsay, J. O., Hooker, G., & Graves, S. (2009). *Functional Data Analysis with R and MATLAB*. Springer New York. <https://doi.org/10.1007/978-0-387-98185-7>
- Ramsay, J. O., & Silverman, B. W. (2005). *Functional Data Analysis* (2nd ed.). Springer New York. <https://doi.org/10.1007/b98888>
- Reigstad, A. G., Strømland, E. A., & Tinghög, G. (2017). Extending the cooperative phenotype: Assessing the stability of cooperation across countries. *Frontiers in Psychology*, 8, 1–12. <https://doi.org/10.3389/fpsyg.2017.01990>
- Reniers, R. L. E. P., Corcoran, R., Drake, R., Shryane, N. M., & Völlm, B. a. (2011). The QCAE: A questionnaire of cognitive and affective empathy. *Journal of Personality Assessment*, 93(1), 84–95. <https://doi.org/10.1080/00223891.2010.528484>
- Rilling, J. K., & Sanfey, A. G. (2011). The neuroscience of social decision-making. *Annual Review of Psychology*, 62(1), 23–48.
<https://doi.org/10.1146/annurev.psych.121208.131647>
- Rosseel, Y. (2012). lavaan : An R package for Structural Equation Modeling. *Journal of Statistical Software*, 48(2), 1–93. <https://doi.org/10.18637/jss.v048.i02>
- Rusbult, C. E., & Van Lange, P. A. M. (2003). Interdependence, interaction, and

- relationships. *Annual Review of Psychology*, 54(1), 351–375.
<https://doi.org/10.1146/annurev.psych.54.101601.145059>
- Simpson, A., Laham, S. M., & Fiske, A. P. (2016). Wrongness in different relationships : Relational context effects on moral judgment. *The Journal of Social Psychology*, 156(6), 594–609. <https://doi.org/10.1080/00224545.2016.1140118>
- Smillie, L. D., Katic, M., & Laham, S. M. (2020). *Personality and moral judgment: Curious consequentialists and polite deontologists*. Manuscript submitted for publication.
- Soto, C. J., & John, O. P. (2016). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology*, 110(3), 1–27.
<https://doi.org/10.1037/pspp0000096>
- Szucs, D., & Ioannidis, J. P. A. (2017). When null hypothesis significance testing is unsuitable for research: A reassessment. *Frontiers in Human Neuroscience*, 11.
<https://doi.org/10.3389/fnhum.2017.00390>
- Tao, Y., Cai, Y., Rana, C., & Zhong, Y. (2020). The impact of the Extraversion-Introversion personality traits and emotions in a moral decision-making task. *Personality and Individual Differences*, 158(March 2019). <https://doi.org/10.1016/j.paid.2020.109840>
- Tett, R. P., & Guterman, H. A. (2000). Situation trait relevance, trait expression, and cross-situational consistency: Testing a principle of trait activation. *Journal of Research in Personality*, 34(4), 397–423. <https://doi.org/10.1006/jrpe.2000.2292>
- Thielmann, I., Spadaro, G., & Balliet, D. (2020). Personality and prosocial behavior: A theoretical framework and meta-analysis. *Psychological Bulletin*, 146(1), 30–90.
<https://doi.org/10.1037/bul0000217>
- Winking, J., & Mizer, N. (2013). Natural-field dictator game shows no altruistic giving. *Evolution and Human Behavior*, 34(4), 288–293.

<https://doi.org/10.1016/j.evolhumbehav.2013.04.002>

Yamagishi, T., Li, Y., Takagishi, H., Matsumoto, Y., & Kiyonari, T. (2014). In search of Homo economicus. *Psychological Science*, 25(9), 1699–1711.

<https://doi.org/10.1177/0956797614538065>

Yamagishi, T., Mifune, N., Li, Y., Shinada, M., Hashimoto, H., Horita, Y., Miura, A., Inukai, K., Tanida, S., Kiyonari, T., Takagishi, H., & Simunovic, D. (2013). Is behavioral pro-sociality game-specific? Pro-social preference and expectations of pro-sociality. *Organizational Behavior and Human Decision Processes*, 120(2), 260–271.

<https://doi.org/10.1016/j.obhdp.2012.06.002>

Zeigler-Hill, V., Noser, A. E., Roof, C., Vonk, J., & Marcus, D. K. (2015). Spitefulness and moral values. *Personality and Individual Differences*, 77, 86–90.

<https://doi.org/10.1016/j.paid.2014.12.050>

Zhao, K., Ferguson, E., & Smillie, L. D. (2017). Individual differences in good manners rather than compassion predict fair allocations of wealth in the dictator game. *Journal of Personality*, 85(2), 244–256. <https://doi.org/10.1111/jopy.12237>

Zhao, K., Kashima, Y., & Smillie, L. (2018). From windfall sharing to property ownership: Prosocial personality traits in giving and taking dictator games. *Games*, 9(2), 30.

<https://doi.org/10.3390/g9020030>

Zhao, K., & Smillie, L. D. (2015). The role of interpersonal traits in social decision making: Exploring sources of behavioral heterogeneity in economic games. *Personality and Social Psychology Review*, 19(3), 277–302. <https://doi.org/10.1177/1088868314553709>

Zhou, Y., Zheng, W., & Gao, X. (2019). The relationship between the big five and cyberbullying among college students: The mediating effect of moral disengagement. *Current Psychology*, 38(5), 1162–1173. <https://doi.org/10.1007/s12144-018-0005-6>

Supplements

Supplements 1

Context-Absent Judgement

- a.** CA-PC 1 – 44.8% of variability
Endorsement of high offers

- c.** CA-PC 2 – 39.5% of variability
Lenience in judging low offers

- e.** CA-PC 3 – 9.5% of variability
Endorsement of equal offers

\$ Decision-maker gave

Context-Present Judgement

- b.** CP-PC 1 – 76.9% of variability
Endorsement of relatively higher offers

- d.** CP-PC 2 – 9.7% of variability
Lenience in judging relatively lower offers

- f.** CP-PC 3 – 5.6% of variability
Endorsement of similar offers

\$ Decision-maker - \$ Receiver gave

Supplementary Figure 1. Principle Components (PCs) for context-absent judgements (a, c, and e) and context-present Judgements (b, d, and f). Mean judgement curves (averaged across participants) for two judgements are plotted as continuous lines. Curvilinear variability in the data along each principle component is presented by adding and subtracting 2 standard deviations of each of the principle components to the mean, and is plotted using + and – signs. Figure created using data from Andrejevic et al. (2019).

Supplements 2

Participants

Exclusion criteria are described in Andrejevic et al. (2019). Specifically, the full sample comprised 371 participants (263 female) between 18 and 36 years of age ($M_{age} = 20.57$, $SD = 2.36$). 27 participants responded to over 30% of attention-check questions in the questionnaires incorrectly, 7 participants responded to over 30% of attention-check catch trials incorrectly, 2 participants placed their response in the middle of the scale throughout the task (i.e. the lack of variation in their responding suggests disengagement with the task), 1 participant did not show any coherence in their responding across identical trials (suggesting random responding), 3 participants drastically changed their context-absent judgement patterns partway through the task (suggesting misunderstanding the task for a substantial period of time), 1 participant consistently rated giving larger amounts as bad and smaller amounts as good (suggesting confusion about scale endpoints, or deliberately providing unexpected behaviour inconsistent with anyone else), and 17 participants misinterpreted the task and judged the Receiver's as opposed to Dictator's action (their response correlated positively with the amount that Receiver had given with $r > .4$). Thus, 58 participants were removed, yielding the final sample of $N = 313$.

Supplements 3

Experimental Paradigm

Participants first read a (fictitious) cover story about a recently conducted experiment in which pairs of individuals had been randomly assigned the roles of a ‘Decision-maker’ and a ‘Receiver’. Participants were told that each Decision-maker had been allocated 10 dollars and was asked to decide how much of this money they would like to share with their Receiver partner (any integer amount ranging from 0 to 10). Before making their decision to share, Decision-makers were ostensibly informed that Receivers had previously decided to share a portion of 10 dollars with a third person. Decision-makers also knew the amount the Receiver had previously shared. Participants were then told that they would be asked, on every trial, to make two consecutive judgements of the same sharing behaviour of a Decision-maker from this previous (in reality – fictitious) experiment.

Each trial of the moral judgement task started with a fixation cross. For the initial, context-absent judgment, participants were shown how much the Decision-maker shared with the Receiver: “Decision-maker gives: \$y” was displayed, where y was a number ranging from 0 to 10. Participants submitted their judgements by clicking at a location within a grey bar scale with endpoints labelled as “bad” and “good”, and these judgements were mapped onto a numerical scale ranging from -150 to 150. Following this initial judgement, the amount the Receiver had given to another person in the previous round was revealed: “Receiver gave: \$x”, where x was a number ranging from 0 to 10. Participants were again required to make the same judgement regarding the Decision-maker’s action after receiving this contextual information. Following this second judgement the screen was cleared, and the trial ended. All possible combinations of x and y values were presented in separate trials, and the entire task consisted of 121 trials (Andrejević et al., 2019).

Supplements 4

Personality Measures

The full list of additional measures are as follows: The Agreeableness scale of the HEXACO Personality Inventory-Revised (HEXACO) (Lee & Ashton, 2018); the Questionnaire of Cognitive and Affective Empathy (QCAE) (Reniers et al., 2011); the Social Dominance Orientation scale (SDO) (Ho et al., 2015); political orientation (from Graham, Haidt, & Nosek, 2009); the Global Belief in a Just World Questionnaire (GBJWQ) (Lipkus, 1991); and the Moral Foundations Questionnaire (MFQ). The order of items within each questionnaire was randomized.

Supplements 5

Big Five Measurement Models

Factor Model. We firstly estimated latent factors at the domain level by following the specifications outlined in Biderman et al. (2019). Here each item depends on one of five latent orthogonal factors common for 12 items, as well as residual measurement error. Residuals among items within the same facet are allowed to covary, while all the other residuals are kept orthogonal, thus accounting for the facet structure of the BFI2 without explicitly estimating facet scores and introducing a large number of parameters in the model. The obtained fit indices ($RMSEA = .052$, 90% CI [.049, .055]; $CFI = .800$; $SRMR = .115$) were comparable to those obtained by Biderman et al. (2019) as presented in their supplementary materials ($RMSEA = .070$, 90% CI [.069, .071]; $CFI = .720$; $SRMR = .136$).

To further improve the model fit of the *Factor Model*, we added latent factors *evaluativeness* and *acquiescence* to the model (turning the model into a bifactorial model), to try to isolate these two potentially confounding factors in the data. Evaluativeness is the tendency to agree with items with content that they value or deem socially desirable, while

acquiescence is the tendency to agree with items regardless of their content. Biderman et al. (2019) dramatically improved the fit by including these two latent factors into the model. However, our model did not improve as prominently. Adding an evaluativeness factor as a freely estimated general factor that all the items load onto, and that is orthogonal to all other latent factors, resulted in unexpected loadings estimates and thus a worse model fit. This may be due to cultural differences between our sample and that of Biderman et al. (2019). Adding acquiescence by defining a latent factor with loadings of all positively keyed items fixed at 1, and all the negatively keyed and reversed items fixed at -1, and making this factor orthogonal to other latent factors, resulted in a slightly better fit ($RMSEA = .048$, 90% CI [.045, .051]; $CFI = .830$; $SRMR = .114$). Notably, this was much smaller improvement as compared to the improvement Biderman et al. (2019) found by adding acquiescence ($RMSEA = .047$, 90% CI [.046, .049]; $CFI = .876$; $SRMR = .066$), indicating that acquiescence bias was much smaller in our data. Nevertheless, we retained the version of the model with acquiescence factor for further analyses (henceforth, *Factor Model*).

Supplementary Table 1 depicts correlations with *Factor Model* estimates, which were highly congruent with results derived by calculating mean trait scores. Spearman correlation coefficients for most relationships varied little across these two ways of calculating trait estimates (unsigned differences across coefficients: $M|\Delta r_s| = .007$, $Mdn|\Delta r_s| = .01$, range = [.001, .030]). This consistency indicates that results relying on mean personality trait scores are largely invariant to the measurement model used, suggesting low measurement error within the BFI-2 inventory in our sample. Acquiescence did not show any association with moral judgement PCs ($|r_s| < .06$), suggesting that acquiescence bias did not affect fairness profiles.

Supplementary Table 1. Association between *Factor Model* estimates of personality and principle component scores for context-absent and context-present judgements.

	Context-absent judgement of:			Context-present judgement of relatively:		
	high offers (CA-PC1)	low offers (CA-PC2)	equal offers (CA-PC3)	higher offers (CP-PC1)	lower offers (CP-PC2)	similar offers (CP-PC3)
Agreeableness	0.11 [0.00, 0.22]	-0.21 [-0.32, -0.09]	-0.02 [-0.13, 0.10]	0.07 [-0.04, 0.18]	-0.16 [-0.26, -0.04]	-0.04 [-0.15, 0.07]
Conscientiousness	0.11 [0.00, 0.21]	-0.15 [-0.26, -0.03]	0.01 [-0.10, 0.11]	0.10 [-0.01, 0.20]	-0.16 [-0.26, -0.05]	0.06 [-0.05, 0.17]
Extraversion	0.15 [0.03, 0.26]	-0.17 [-0.27, -0.05]	-0.01 [-0.13, 0.10]	0.12 [0.02, 0.23]	-0.19 [-0.30, -0.09]	0.00 [-0.11, 0.11]
Negative Emotionality	-0.09 [-0.20, 0.03]	0.08 [-0.03, 0.19]	-0.08 [-0.18, 0.03]	-0.04 [-0.15, 0.07]	0.07 [-0.03, 0.18]	-0.02 [-0.13, 0.09]
Openness	0.03 [-0.07, 0.14]	-0.09 [-0.20, 0.01]	0.05 [-0.06, 0.15]	0.12 [0.01, 0.24]	-0.15 [-0.27, -0.04]	0.02 [-0.09, 0.14]
Acquiescence	-0.04 [-0.14, 0.08]	0.05 [-0.06, 0.16]	-0.03 [-0.14, 0.08]	-0.05 [-0.16, 0.07]	-0.03 [-0.08, 0.14]	0.03 [-0.08, 0.14]

Note. Spearman's rank order correlation coefficients (r) are shown along with 95% Confidence

Intervals (in brackets). Cell colour intensity scales with the strength of the association and ranges from red (negative correlation) and green (positive correlation), to white (zero correlation). The darkest colour is anchored to the strongest correlation in the table. Coefficients with $p < 0.05$ (two-tailed) are bolded, however, note that no correction for multiple tests was performed.