



How do the moral foundations attract the needle of a moral compass?: Relative scores as a supplementary method of measuring moral foundations

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ABSTRACT

Moral foundations (i.e., care, fairness, loyalty, authority, and purity) are systems that help people make important decisions. We propose a new approach to the scoring of moral foundations by measuring their relative importance (i.e., how important the foundation is compared to others). In Study 1 ($N = 1283$), we observed that absolute and relative scores give different information. For example, women scored higher than men on absolute care, fairness, and purity; however, women scored higher than men on relative care, and men scored higher than women on relative loyalty and authority. In Study 2 ($N = 341$), we observed that absolute and relative scores of moral foundations gave different between-sex and between-country-type results. For instance, non-WEIRD women scored higher than WEIRD (i.e., Western, Educated, Industrialized, Rich, and Democratic) women on absolute loyalty, authority, and purity; however, they scored higher only on relative loyalty. Our results suggest that supplementing moral foundations research with relative scores is a considerable contribution, as relative scores may better reflect the context of everyday decisions when people are forced to decide about the importance of different moral foundations.

1. Introduction

Moral foundations (i.e., care, fairness, loyalty, authority, and purity) are intuitive, innate, and universally available mental mechanisms that evolved to help people make decisions when solving common life problems, especially those related to social life (Graham et al., 2011; Graham & Haidt, 2012; Haidt & Joseph, 2007). For instance, care motivates people to help others relieve their pain and suffering, while fairness motivates reciprocity (which is why care and fairness were named *individualizing* moral foundations). Alternatively, loyalty catalyzes the creation and maintenance of social coalitions, authority helps one maintain social hierarchies, and purity prevents contamination and degradation (which is why they were named *binding* moral foundations).

However, sometimes people face moral dilemmas in which they must choose between foundations as if they were competing forces that affect the needle of their moral compass. Imagine the case of Magda, who works in the recruitment department. She pays much attention to fairness and loyalty, and care, authority, and purity are, for her, less

important. Magda reviews the CVs of the candidates and decides which of the employees to hire: one of them is quite competent but an unknown person, and the other is the less competent son of her friend. Magda is facing the situation of a moral dilemma and may (even unconsciously) asks herself which moral foundation is more relevant for her: fairness or loyalty? If it is fairness, Magda decides to hire a more competent person. If it is loyalty, she chooses the son of a friend with whom she has a social bond.

Following the metaphor of moral foundations as forces that affect the needle of a moral compass, we want to understand how people make moral judgments in their everyday situations when two or more foundations conflict. The traditional way of measuring moral foundations shows every moral foundation's general level of importance (Graham et al., 2011). However, what if someone must choose between two of them, like in the case of Magda? We aimed to understand this issue more deeply by conceptualizing moral foundations in a different way. We propose a new approach to the scoring of moral foundations (calling the traditional way of scoring "absolute scores") by measuring the relative

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importance of moral foundations (calling the new way of scoring “relative scores”). The described method makes it possible to consider how vital the moral foundations are for a given person compared to other moral foundations. Thanks to this approach, we can measure which foundation Magda prefers more: fairness or loyalty?

Below we present two studies where we tested the application of relative scores of moral foundations in areas that have shown effects related to absolute scores: sex differences (Atari et al., 2020), attitudes towards science (Pagliaro et al., 2021; Rutjens et al., 2018), and the Dark Triad traits (Jonason et al., 2015; Karandikar et al., 2019). We tested the validity of introducing an additional method measuring moral foundations as a supplementary method that provides new information about an individual's moral preferences. In addition, testing the correlations of relative moral foundations with attitudes towards science and the Dark Triad traits is meaningful because lower empathy (characteristic of the Dark Triad traits) and positive attitudes towards science are associated with higher acceptance of the violation of ethical norms (e.g., causing suffering) for scientific reasons (Jach & Buczek, 2021).

2. Study 1: absolute and relative moral foundations and attitudes towards science

In Study 1, we looked at the relationships between absolute and relative scores of moral foundations, participants' sex, and attitudes towards science. Women score higher than men on care, fairness, and purity worldwide (Atari et al., 2020). We expected to replicate sex differences in absolute moral foundations, and at the same time, we hypothesized that the relative scores might bring new information about sex differences when participants need to choose one of two foundations because when people are forced to choose, they reveal what they really care about (Bendixen et al., 2015; Buss et al., 1999; Li et al., 2002). More specifically, we predicted that the relative importance of care would be higher than other foundations in women, following the idea that care is often triggered in response to signals sent by offspring (Bjorklund & Shackelford, 1999; Haidt, 2012). Because loyalty is often triggered in response to signals related to the formation of coalitions aimed at acquiring or securing resources (Haidt, 2012; van Vugt et al., 2007), we predicted the relative importance of this foundation would be higher than other foundations in men.

Further, we explored how moral foundations may be associated with attitudes towards science, given the sweeping importance of such attitudes in the modern world (Staerklé et al., 2022). Science provides solutions to many contemporary challenges, such as climate change (Pearce et al., 2018) or public health issues (Gatseva & Argirova, 2011), although their effective application requires a better understanding of the psychological factors affecting people's attitudes towards science (Rutjens et al., 2018). Moral foundations are related to attitudes towards science (Rutjens et al., 2018). Moreover, endorsement of individualizing moral foundations was associated with lower acceptance of major violations of COVID-19 regulations (Bruchmann & LaPierre, 2022), and people perceived scientists as caring less about loyalty, authority, and purity (Rutjens & Heine, 2016). Therefore, we expected that more favorable attitudes towards science would be associated with higher endorsement of individualizing moral foundations and lower endorsement of binding moral foundations.

2.1. Method

2.1.1. Participants & procedure

A sample of 1286 Polish participants (618 men; 665 women; 3 people indicated “other”) aged from 18 to 86 consented to participate in an anonymous, online study via the Polish survey platform “Ariadna”. For their participation, they received points that could be exchanged for prizes. The participants were informed of the nature of the study. If they consented via a tick-box, they provided information about their demographic characteristics and the levels of variables related to moral

foundations. The data was collected as a part of more extensive studies conducted on a quota sample of Polish internet users. A G-power analysis showed that the sample size was sufficient to detect the small size of the effects in planned $2 \times 2 \times 5$ mixed model ANOVAs ($f = 0.04$), assuming α is 0.05 and $1-\beta$ is 0.80. After the survey, participants were thanked and had an opportunity to contact the first author via e-mail in case of questions or concerns. The study was approved by the Ethics Committee of the University of Silesia in Katowice. Those who indicated “other” for sex were excluded from analyses leaving us with 1283 people with a mean age of 49.25 ($SD = 16.34$), where men and women were similar ($p = .12$).

2.1.2. Measures

Participants' absolute moral foundations were measured using the Polish translation (Jarmakowski-Kostrzanowski & Jarmakowska Kostrzanowska, 2016) of the Moral Foundations Questionnaire (Graham et al., 2011). Participants were asked how relevant (1 = *not at all relevant*; 6 = *extremely relevant*) or how much they agreed (1 = *strongly disagree*; 6 = *strongly agree*) with 30 items corresponding to five moral foundations of *care* (e.g., “Whether or not someone suffered emotionally.”; Cronbach's $\alpha = 0.76$), *fairness* (e.g., “Whether or not some people were treated differently than others.”; $\alpha = 0.73$), *loyalty* (e.g., “Whether or not someone's action showed love for his or her country.”; $\alpha = 0.72$), *authority* (e.g., “Whether or not someone showed a lack of respect for authority.”; $\alpha = 0.68$), and *purity* (e.g., “Whether or not someone violated standards of purity and decency.”; $\alpha = 0.73$). The higher the score on each scale, the more important a given foundation was to participants.

To obtain information about the relative position of each moral foundation, the average and the standard deviation of the results relating to the five moral foundations were calculated for each participant. Then, the standardized scores describing the relative levels of care, fairness, loyalty, authority, and purity were calculated using the following formula:

$$MFRS = [MFAS - M(MFAS)] / SD(MFAS)$$

where *MFRS* is the relative moral foundation score, *MFAS* is the absolute moral foundation score, $M(MFAS)$ is the mean absolute moral foundation score, and $SD(MFAS)$ is the standard deviation of the absolute moral foundation scores. In cases where $SD(MFAS)$ was 0, we also defined all MFRSs as 0. The mean of these obtained relative scores was 0, and the standard deviation was 1. Positive scores indicated an above-average position of a given moral foundation in the individual moral system, while negative scores indicated a below-average status of a given moral foundation.

We measured attitudes towards science using the Views of Science Questionnaire (Jach, 2021). Participants were asked how much they agreed (1 = *strongly disagree*; 5 = *strongly agree*) with 16 items corresponding to their attitudes to scientific methods (e.g., “People who doubt in the fundamentals of science are in fact unable to grasp them.”), the role of scientists as experts (e.g., “Scientists' work is more useful than the work of priests, philosophers or artists.”), and the functions that science performs in everyday life (e.g., “The discoveries of scientists make us feel less and less anxious about our future.”). The overall score is the sum of points collected in all items ($\alpha = 0.92$).

2.2. Results & discussion

Table 1 contains descriptive statistics and pairwise tests for sex differences for absolute and relative moral foundations. We begin here with absolute moral foundations. A 2 (sex) \times 5 (moral foundation) mixed-model ANOVA revealed an interaction [$F(4, 5124) = 12.23, p < .001, \eta_p^2 = 0.01$] and main effects for moral foundations [$F(4, 5124) = 1342.49, p < .001, \eta_p^2 = 0.51$] and participant's sex [$F(1, 1281) = 13.31, p < .001, \eta_p^2 = 0.01$]. The interaction revealed between- and within-sex

Table 1
Descriptive statistics and sex differences among absolute and relative moral foundations scores (Study 1).

	Care	Fairness	Loyalty	Authority	Purity
Absolute differences					
Overall: <i>M</i>	30.04	29.52	24.33	22.71	25.17
(<i>SD</i>)	(3.79)	(3.75)	(4.35)	(4.67)	(4.81)
Men: <i>M</i> (<i>SD</i>)	29.31 (3.97)	28.95 (3.93)	24.27 (4.43)	22.75 (4.65)	24.74 (4.91)
Women: <i>M</i> (<i>SD</i>)	30.65 (3.50)	30.05 (3.49)	24.38 (4.28)	22.67 (4.70)	25.56 (4.68)
<i>t</i>	6.38**	5.29**	0.44	-0.32	3.06*
<i>d</i>	0.36	0.30	0.02	-0.02	0.17
Relative differences					
Overall: <i>M</i> (<i>SD</i>)	0.85 (0.54)	0.71 (0.54)	-0.48 (0.60)	-0.84 (0.62)	-0.24 (0.66)
Men: <i>M</i> (<i>SD</i>)	0.80 (0.57)	0.68 (0.58)	-0.41 (0.65)	-0.80 (0.66)	-0.27 (0.68)
Women: <i>M</i> (<i>SD</i>)	0.90 (0.49)	0.73 (0.50)	-0.54 (0.54)	-0.89 (0.57)	-0.21 (0.63)
<i>t</i>	3.52**	1.79	-3.71**	-2.65*	1.53
<i>d</i>	0.20	0.10	-0.21	-0.15	0.09

* $p < .01$.

** $p < .001$.

effects. Women scored higher than men on care, fairness, and purity. Moreover, each moral foundation differed from one another within women ($t_s \geq 6.67$, $p_s < .001$, Cohen's $d_s \geq 0.14$) and within men ($t_s \geq 3.11$, $p_s < .002$, Cohen's $d_s \geq 0.10$). In addition, men ($M = 54.14$, $SD = 11.98$) had more ($t[1281] = 2.47$, $p = .014$, $d = 0.14$) favorable attitudes towards science than women did ($M = 52.54$, $SD = 11.23$).

Second, we used the same analytical plan to examine relative differences in moral foundations and revealed an interaction [$F(4, 5124) = 7.48$, $p < .001$, $\eta_p^2 = 0.01$] and a within-subjects effect of relative moral foundations [$F(4, 5124) = 1623.89$, $p < .001$, $\eta_p^2 = 0.56$]; there was no longer a sex difference [$F(1, 1281) = 0.12$]. Women scored higher than men on care, but men scored higher than women on loyalty and authority. In both sexes, all differences between pairs of relative scores were significant ($t_s \geq 3.81$; $p_s < .001$, $d_s \geq 0.20$).

In the next step, we tested correlations between absolute and relative moral foundations and their correlations with attitudes towards science. The correlations ($p_s < .001$) between absolute and relative moral foundations ranged from 0.38 (i.e., authority) to 0.62 (i.e., purity; care = 0.44, fairness = 0.44, loyalty = 0.43) with no difference larger than 0.04 in men and women. Therefore, we compared the correlations between attitudes towards science and the relative and absolute moral foundations with a Steiger's z -test to control for this overlap. However, given the uniformity in the correlation between the sexes, we did not double moderate these correlations further. We found that care and fairness were positively and comparably correlated ($p_s < .001$) with attitudes towards science for both absolute and relative moral foundations (r_s for care subsequently: 0.17 and 0.10, $z = 1.80$, $p = .072$; r_s for fairness subsequently: 0.21 and 0.16, $z = 1.30$, $p = .194$), whereas purity was negatively correlated in both cases (r_s subsequently: -0.11 and -0.24, $p_s < .001$). Moreover, the correlation between attitudes towards science and the relative score of purity was stronger ($z = 3.38$, $p < .001$) than the correlation between attitudes towards science and the absolute score of purity.

Lastly, we tested the incremental validity of the relative method of assessing relative moral foundations correlates over absolute foundations correlates towards predicting attitudes towards science. In Step 1, we included the absolute moral foundations [$R^2 = 0.09$; $F(3, 1279) = 39.81$, $p < .001$] first and then relative foundations [$R^2 = 0.11$; $F(6, 1276) = 25.76$, $p < .001$] second suggesting the addition of relative foundations accounted for more variance [$\Delta R^2 = 0.02$; $F(3, 1276) = 10.80$, $p < .001$]. Then we flipped this process around; with Step 1, we included relative moral foundations [$R^2 = 0.07$; $F(3, 1279) = 30.83$, $p < .001$] and absolute moral foundations [$R^2 = 0.11$; $F(6, 1276) = 25.76$, $p < .001$] second suggesting the addition of absolute foundations accounted for more variance [$\Delta R^2 = 0.04$; $F(3, 1276) = 19.36$, $p < .001$]. In this combined regression model predicant attitudes towards science, absolute fairness ($\beta = 0.35$, $p < .001$) and relative purity ($\beta = -0.20$, $p < .001$) had residual correlations.

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3. Study 2: absolute and relative moral foundations and the Dark Triad traits

In Study 1, we analyzed believing in science as one potential correlate of moral foundations, but there are more traits that may be informative of differences in absolute compared to relative moral foundations. In Study 2, we consider the role of the Dark Triad personality traits for moral foundations. The Dark Triad consists of three socially aversive traits, namely Machiavellianism, narcissism, and psychopathy, which affect relationships with others (Jones & Paulhus, 2014). Characteristics of Dark Triad traits include cynicism and manipulateness (i.e., Machiavellianism), entitlement and grandiosity (i.e., narcissism), and impulsivity and callousness (i.e., psychopathy). These characteristics may indicate a lack of moral character, which manifests in honesty, kindness, justness, courage, and self-control (Goodwin, 2015). Therefore, it may be informative to check which aspects of morality are more or less important for people high on the Dark Triad traits. Prior research has linked the Dark Triad traits to moral foundations, but it was only concerned with absolute moral foundations (Jonason et al., 2015; Karandikar et al., 2019). In this study, we examine the overall, between sex, between cultures, and between method correlations between the Dark Triad traits and moral foundations. We also attempt to replicate results from Study 1 about differences in moral foundations overall and by participant's sex, and culture.

3.1. Method

3.1.1. Participants & procedures

A sample of 341 English-speaking participants (202 men, 139 women) aged 18 to 69 consented to participate in an anonymous, online study via SONA and MTurk platforms and correctly filled out the questionnaires. One hundred and ninety-four participants (94 men and 100 women) were from WEIRD countries (i.e., Western, Educated, Industrialized, Rich, and Democratic; see Henrich et al., 2010), while 147 (108 men and 39 women) were from non-WEIRD countries. A G-power analysis showed that the sample size was sufficient to detect the small size of the effects in planned $2 \times 2 \times 5$ mixed model ANOVAs ($f = 0.07$), assuming α is 0.05 and $1-\beta$ is 0.80. Participants were informed of the nature of the study. If they consented via a tick-box, they provided information about their demographic characteristics and filled out the moral foundations and Dark Triad traits questionnaires. Thirty-three percent of participants received remuneration, and 67 % participated in the study as volunteers. After the procedure, the participants were thanked and debriefed. The respondents also received information about possible sources of psychological support if participation in the study would cause them concern. The procedure was approved by The Charles Sturt University Human Research Ethics Committee.

3.1.2. Measures

Participants' moral foundations were measured using a short version of the Moral Foundations Questionnaire, including twenty items selected from the 30-item version of MFQ (Graham et al., 2011; items 1–10 and 16–25). Cronbach's alpha coefficients were as follows: care $\alpha = 0.71$, fairness $\alpha = 0.64$, loyalty $\alpha = 0.69$, authority $\alpha = 0.69$, and purity $\alpha = 0.72$. The absolute measures were converted into relative measures in the same way as in Study 1.

The Dark Triad traits were measured using the Short Dark Triad questionnaire (Jones & Paulhus, 2014), containing scales (9 items each) for Machiavellianism (e.g., "I like to use clever manipulation to get my

way.”; $\alpha = 0.87$), narcissism (e.g., “People see me as a natural leader.”; $\alpha = 0.75$), and psychopathy (e.g., “People who mess with me always regret it.”; $\alpha = 0.87$). Respondents indicated to what extent they agree ($1 = disagree\ strongly, 5 = strongly\ agree$). Items on the respective scales were summed to create indexes of each trait.

3.2. Results & discussion

We begin here with absolute moral foundations. We conducted a 2 (country-type) \times 2 (sex) \times 5 (moral foundation) mixed-model ANOVA (Table 2). We found a three-way interaction [$F(4, 1348) = 4.88, p < .001, \eta_p^2 = 0.01$] reflecting two two-way interactions and a lack of one between country-type and sex [$F(1, 337) = 2.55, p = .111, \eta_p^2 = 0.01$]. There was a two-way interaction between sex and moral foundation [$F(4, 1348) = 4.02, p = .003, \eta_p^2 = 0.01$], such that men scored higher than women on loyalty and authority. There was a two-way interaction between country-type and moral foundation [$F(4, 1348) = 10.21, p < .001, \eta_p^2 = 0.03$] such that participants from non-WEIRD countries scored higher than participants from WEIRD countries did on loyalty, authority, and purity.

In addition, there were main effects of moral foundation [$F(4, 1348) = 3.54, p < .001, \eta_p^2 = 0.03$], sex [$F(1, 337) = 4.71, p = .031, \eta_p^2 = 0.01$], and country-type [$F(1, 337) = 9.31, p = .003, \eta_p^2 = 0.03$]. Care was valued higher than loyalty ($t = 2.46, p = .015, Cohen's\ d = 0.21$), authority ($t = 2.32, p = .021, d = 0.20$), and purity ($t = 4.26, p < .001, d = 0.33$); fairness was valued higher than loyalty, authority, and purity (ts

$\geq 3.68, ps < .001, ds \geq 0.29$); moreover, loyalty ($t = 2.14, p = .033, d = 0.11$) and authority ($t = 2.35, p = .020, d = 0.013$) were valued higher than purity. Men's scores were generally higher than women's ($t = 2.17, p = .031, d = 0.19$). Participants from non-WEIRD countries generally scored higher than participants from WEIRD countries ($t = 3.05, p = .003, d = 0.27$).

Then, we used the same analytical plan to examine relative differences in moral foundations (Table 2). We found a three-way interaction [$F(4, 1348) = 3.53, p = .007, \eta_p^2 = 0.01$], reflecting one two-way interaction and lack of interactions between moral foundation and sex [$F(4, 1348) = 1.09, p = .362, \eta_p^2 < 0.01$] and country-type and sex [$F(1, 337) = 0.00, p = .984, \eta_p^2 = 0.00$]. There was a two-way interaction between country-type and moral foundation [$F(4, 1348) = 4.31, p = .002, \eta_p^2 = 0.01$], such that participants from non-WEIRD countries scored higher than participants from WEIRD countries did on loyalty and participants from WEIRD countries scored higher than participants from non-WEIRD countries did on care and fairness. There was also main effect of moral foundation [$F(4, 1348) = 3.54, p = .007, \eta_p^2 = 0.01$], such as purity was valued less than the other four moral foundations ($ts \geq 2.48, ps \leq .014, ds \geq 0.24$).

Next, we tested correlations between absolute and relative moral foundations and their correlations with the Dark Triad traits (Table 3). The correlations ($ps < .001$) between absolute and relative moral foundations ranged from 0.54 (i.e., fairness) to 0.62 (i.e., care; loyalty = 0.60, authority = 0.56, purity = 0.55). We compared the correlations between the Dark Triad traits and the absolute and relative moral

Table 2
Between-subjects effects of participant's sex and country-type on moral foundations (Study 1).

	Absolute mean (SD)					Relative mean (SD)				
	Overall	Men	Women	t	g	Overall	Men	Women	t	g
Care										
Overall	18.25 (3.21)	18.17 (3.04)	18.38 (3.45)	-0.41	-0.07	0.03 (1.04)	-0.07 (1.02)	0.17 (1.06)	1.05	0.23
Non-WEIRD	18.15 (2.54)	18.13 (2.72)	18.21 (2.00)	-0.12	-0.03	-0.16 (1.06)	-0.15 (1.02)	-0.20 (1.16)	0.25	0.05
WEIRD	18.33 (3.64)	18.20 (3.38)	18.45 (3.87)	-0.53	-0.07	0.17 (1.01)	0.01 (1.02)	0.31 (0.99)	-2.05*	-0.30
t	-0.41	-0.15	-0.39			2.77**	-1.10	-2.63**		
g	-0.06	-0.02	-0.07			0.32**	0.16	0.49		
Fairness										
Overall	18.51 (2.93)	18.56 (2.87)	18.44 (3.03)	0.59	0.04	0.19 (0.99)	0.12 (1.02)	0.29 (0.95)	-0.41	-0.17
Non-WEIRD	18.53 (2.67)	18.68 (2.73)	18.12 (2.51)	1.03	0.21	0.09 (1.00)	0.17 (0.98)	-0.12 (1.03)	1.54	0.29
WEIRD	18.49 (3.12)	18.41 (3.03)	18.57 (3.21)	-0.37	0.05	0.27 (0.99)	0.07 (1.07)	0.45 (0.88)	-2.68**	-0.39
t	-0.27	0.64	-0.82			-2.01*	0.71	-3.04**		
g	-0.01	0.09	-0.15			-0.18*	0.10	-0.62		
Loyalty										
Overall	17.54 (3.56)	18.27 (3.14)	16.48 (3.87)	2.94**	0.52	0.00 (0.94)	0.10 (0.93)	-0.14 (0.93)	1.31	0.26
Non-WEIRD	18.59 (2.42)	18.63 (2.43)	18.45 (2.41)	0.30	0.07	0.15 (0.87)	0.14 (0.89)	0.17 (0.82)	-0.15	-0.03
WEIRD	16.75 (4.06)	17.85 (3.77)	15.71 (4.07)	4.43***	0.54	-0.11 (0.97)	0.05 (0.98)	-0.26 (0.95)	2.36*	0.32
t	4.44***	1.65	4.31***			2.36*	0.67	2.45*		
g	0.53	0.25	0.74			0.28*	0.10	0.47		
Authority										
Overall	17.59 (3.41)	18.25 (3.13)	16.64 (3.57)	2.86**	0.49	0.02 (0.98)	0.10 (1.00)	-0.11 (0.93)	1.25	0.22
Non-WEIRD	18.51 (3.08)	18.61 (2.86)	18.23 (3.65)	0.63	0.12	0.14 (1.02)	0.15 (1.02)	0.11 (1.03)	0.21	0.04
WEIRD	16.89 (3.48)	17.82 (3.38)	16.02 (3.36)	3.87***	0.53	-0.08 (0.94)	0.05 (0.98)	-0.20 (0.89)	1.77	0.27
t	3.92***	1.72	3.61***			1.75	0.70	1.66		
g	0.49	0.25	0.64			0.23	0.10	0.33		
Purity										
Overall	17.16 (3.44)	17.69 (3.09)	16.41 (3.98)	1.90	0.37	-0.23 (0.97)	-0.25 (0.94)	-0.21 (1.02)	-0.98	-0.04
Non-WEIRD	17.86 (2.85)	17.80 (2.67)	18.05 (3.33)	-0.41	-0.09	-0.22 (0.96)	-0.31 (0.96)	0.03 (0.95)	-1.89	-0.36
WEIRD	16.62 (3.75)	17.52 (3.53)	15.78 (3.77)	3.65***	0.48	-0.25 (0.98)	-0.19 (0.93)	-0.31 (1.03)	0.86	0.12
t	3.25**	0.58	3.62***			0.95	-0.89	1.86		
g	0.37	0.09	0.62			0.03	-0.13	0.34		

Note. As there were differences in the number of participants across sex and country-type groups, we used Hedges' g as a measure of the effect size.

* $p < .05$.
 ** $p < .01$.
 *** $p < .001$.

Table 3
Correlations between absolute and relative moral foundations and the Dark Triad traits (Study 2).

	Machiavellianism				Non-WEIRD	WEIRD	z
	Overall	Men	Women	z			
Care							
Absolute	0.04	0.31***	-0.19*	4.61***	0.36***	-0.05	3.87***
Relative	-0.31***	-0.11	-0.47***	3.59***	-0.18*	-0.34***	1.56
z	4.70***	4.34***	2.56*		4.82***	2.96**	
Fairness							
Absolute	0.12*	0.29***	-0.05	3.13***	0.43***	0.00	4.17***
Relative	-0.29***	-0.20**	-0.39***	1.88*	-0.09	-0.38***	2.81**
z	5.50***	5.07***	2.97**		4.71***	3.91**	
Loyalty							
Absolute	0.65***	0.52***	0.72***	-2.98**	0.54***	0.65***	-1.55
Relative	0.27***	0.05	0.47***	-4.14***	0.01	35***	-3.22**
z	6.23***	6.29***	3.10**		5.04***	3.82***	
Authority							
Absolute	0.62***	0.61***	0.58***	0.42	0.60***	0.61***	-0.14
Relative	0.24***	0.22**	0.22**	0.00	0.27***	21**	0.58
z	6.03***	4.69***	3.51***		3.40***	4.70***	
Purity							
Absolute	0.54***	0.51***	0.53***	-0.25	0.52***	0.53***	-0.13
Relative	0.12*	0.05	0.22**	-1.56	-0.01	0.18*	-1.74
z	6.19***	5.08***	2.94**		4.98***	3.90***	
<hr/>							
	Narcissism				Non-WEIRD	WEIRD	z
	Overall	Men	Women	z			
Care							
Absolute	0.13*	0.46***	-0.20*	6.29***	0.36***	0.05	3.17**
Relative	-0.25***	-0.01	-0.50***	4.85***	-0.12	-0.29***	1.61
z	5.06***	5.07***	2.79**		4.26***	3.42***	
Fairness							
Absolute	0.21***	0.41***	-0.03	4.19***	0.38***	0.12	2.53*
Relative	-0.29***	-0.21**	-0.37***	1.58	-0.11	-0.38***	2.62**
z	6.76***	6.61***	2.95**		4.38***	5.15***	
Loyalty							
Absolute	0.66***	0.58***	0.69***	-1.67*	0.55***	0.68***	-1.91
Relative	0.24***	0.03	0.44***	-3.98***	0.01	0.33***	-3.02**
z	6.87***	6.28***	2.93**		5.16***	4.53***	
Authority							
Absolute	0.64***	0.61***	0.63***	-0.29	0.58***	0.65***	-1.02
Relative	0.22***	0.15*	0.28***	-1.23	0.24**	0.19**	0.48
z	6.72***	5.44***	3.60***		3.43***	5.53***	
Purity							
Absolute	0.57***	0.56***	0.54***	0.26	0.53***	0.57***	-0.52
Relative	0.11*	0.05	0.21*	-1.47	-0.01	0.18*	-1.74
z	6.88***	5.77***	3.14**		5.10***	4.44***	
<hr/>							
	Psychopathy				Non-WEIRD	WEIRD	z
	Overall	Men	Women	z			
Care							
Absolute	0.02	0.28**	-0.24**	4.79***	0.19*	-0.04	2.11*
Relative	-0.32***	-0.12	-0.53***	3.22***	-0.17*	-0.39***	2.18*
z	4.58***	4.11***	2.76**		3.11**	3.62***	
Fairness							
Absolute	0.14*	0.34**	-0.10	4.08***	0.31***	0.05	2.45*
Relative	-0.26***	-0.11	-0.42***	3.03**	0.00	-0.39***	3.73***

(continued on next page)

Table 3 (continued)

	Psychopathy			z	Non-WEIRD	WEIRD	z
	Overall	Men	Women				
z	5.34***	4.68***	2.84**		2.72**	4.54***	
Loyalty							
Absolute	0.60***	0.52***	0.61***	-1.19	0.30***	0.67***	-4.54***
Relative	0.22***	0.03	0.40***	-3.54***	-0.12	0.36***	-4.51***
z	5.92***	5.43***	2.24*		3.68***	4.03***	
Authority							
Absolute	0.58***	0.54***	0.56***	-0.26	0.42***	0.63***	-2.66**
Relative	0.21***	0.12	0.28***	-1.50	0.19*	0.20**	-0.09
z	5.56***	4.75***	2.75**		2.13*	5.11***	
Purity							
Absolute	0.56***	0.53***	0.55***	-0.25	0.40***	0.60***	-2.44*
Relative	0.18***	0.09	0.32***	-2.17*	0.09	0.24***	-1.40
z	5.72***	4.93***	2.27*		2.80**	4.24***	

Note. z-values in rows are Steiger's z-s; z-values in columns are Fisher's z-s.

* $p < .05$.
 ** $p < .01$.
 *** $p < .001$.

foundations with a Steiger's z-test to control for this overlap. Considering absolute scores, in non-WEIRD participants, the Dark Triad traits correlated positively with moral foundations, and in the WEIRD sample, the Dark Triad traits correlated positively with loyalty, authority, and purity. However, considering relative scores in the non-WEIRD sample, the Dark Triad traits correlated positively with authority and negatively with care. In WEIRD participants, the Dark Triad traits correlated negatively with relative scores on care and harm and positively with loyalty, authority, and purity. Considering absolute scores, among men, the Dark Triad traits correlated positively with all moral foundations, and among women, the Dark Triad traits correlated positively with loyalty, authority, and purity and negatively with care and harm. However, considering relative scores among women, the Dark Triad traits correlated negatively with care and fairness and positively with loyalty, authority, and purity, and among men, the Dark Triad traits correlated positively with authority and negatively with fairness.

We also looked at the overall patterns of the relationship between the Dark Triad traits and absolute and relative moral foundations. Absolute care correlated positively with narcissism and was not linked to Machiavellianism and psychopathy. However, relative care correlated negatively with each Dark Triad trait. Absolute fairness correlated positively with Machiavellianism, narcissism, and psychopathy, but correlations of relative fairness with the Dark Triad traits were negative in each case. Both absolute and relative loyalty, authority, and fairness correlated positively with all the Dark Triad traits; however, absolute correlations were stronger than relative correlations.

Lastly, we tested the regression models of absolute and relative moral foundations with Machiavellianism, narcissism, and psychopathy as predictors (Table 4). The Dark Triad traits explained more variance in absolute than relative scores in loyalty, authority, and purity. However,

more variance of care and fairness was explained by the Dark Triad traits in relative than absolute scores.

4. General discussion

The standard way of calculating the absolute scores of moral foundations via the Moral Foundations Questionnaire (Graham et al., 2011) gives only information about the level of each of them independently, which is likely an artificial way of looking at morality. In this article, we proposed calculating relative scores of moral foundations, which show the position of specific foundations in someone's moral system and how close or far they are to other moral foundations. Relative scores illustrate why it may be difficult for someone to make a moral decision and why someone else acts more decisively. Relative scores also make it possible to notice more nuanced relationships between moral foundations and other psychological factors. Using relative scores as an alternative to absolute scores have an established position in psychology (Fischer & Milfont, 2010). The relative importance of different life goals has been studied between different cultures along the dimensions of extrinsic versus intrinsic and self-transcendent versus physical (Grouzet et al., 2005). We can also calculate the relative importance of individual values identified in the theory of basic individual values (Schwartz et al., 2012). Our method of calculating MFQ scores introduces the use of relative scores, also in relation to moral foundations.

In Study 1, we observed that absolute and relative scores give different information about how a so-called moral compass works in men and women. When measuring the absolute scores, we found that women scored higher than men on care, fairness, and purity, consistent with past findings among 67 countries (Atari et al., 2020). However, when measuring the relative scores, we found that women prioritize

Table 4

The Dark Triad traits as predictors (i.e., residualized β -values) of absolute and relative moral foundations (Study 2).

Predictors	Absolute					Relative				
	Care	Fairness	Loyalty	Authority	Purity	Care	Fairness	Loyalty	Authority	Purity
Machiavellianism	-0.11	-0.11	0.32**	0.27**	0.17*	-0.20*	-0.17	0.23*	0.16	0.00
Narcissism	0.43**	0.35**	0.35*	0.36**	0.25**	0.15	-0.14	0.05	0.06	-0.12
Psychopathy	-0.25*	-0.07	0.06	0.08	0.22**	-0.29**	-0.01	0.01	0.03	0.28**
R ²	0.05**	0.05**	0.48**	0.44**	0.36**	0.12**	0.09**	0.08**	0.06**	0.04**

* $p < .05$.
 ** $p < .01$.

care more than men, whereas men prioritize loyalty and authority. These results align with our predictions and the concept that moral foundations correspond with evolutionary goals related to offspring protection and forming coalitions (Haidt, 2012), which were asymmetrically important for ancestral men and women (Bjorklund & Shackelford, 1999; van Vugt et al., 2007). The foundations of care, fairness, and purity correlated with attitudes towards science regardless of the scoring method; however, relative purity correlated with such attitudes higher than absolute purity. This result is consistent with past findings showing that individualizing foundations predict trust in science positively, whereas binding foundations predict trust in science negatively (Pagliaro et al., 2021). On the one hand, absolute scores of moral foundations explained more variance of attitudes towards science than relative scores, but on the other hand, the model including both scores explained more of the variance than models containing only one type of score. Moreover, the difference in the proportion between the variance explained by the models may result from the fact that the absolute moral foundations scores are independent of each other while the relative moral foundations scores depend on each other, which may reduce their influence on the dependent variable (Fischer & Milfont, 2010; Rudnev, 2021).

In Study 2, we observed that absolute and relative scores of moral foundations gave different between-sex and between-country-type results. For example, although WEIRD men and WEIRD women did not differ on absolute rates of care and fairness, the relative positions of these two foundations were higher among WEIRD women than WEIRD men. Although WEIRD men valued absolute purity more than women, the relative position of this foundation among WEIRD men and women was similar. From a different perspective, non-WEIRD men and women's scores did not differ either in an absolute or relative manner. Considering cultural comparisons, non-WEIRD men did not differ in absolute or relative scores from WEIRD men. However, the landscapes of absolute and relative foundations differed between non-WEIRD and WEIRD women. In an absolute manner, both groups of women were comparable in care and fairness evaluation, but in a relative manner, WEIRD women scored higher on both mentioned foundations. Moreover, non-WEIRD women scored higher than WEIRD women on absolute loyalty, authority, and purity, but they scored higher only on relative loyalty. Although people from non-WEIRD cultures value loyalty and purity more than people from WEIRD cultures (Graham et al., 2011), the variation in moral attitudes can be explained by between-culture factors and sometimes by within-culture factors (Vauclair & Fischer, 2011). Our results support an approach highlighting between- and within-culture similarities and differences. Sometimes the similarity in an absolute manner may hide differences in a relative manner (as in the case of care and fairness in WEIRD men and WEIRD women); sometimes, behind the differences in an absolute manner, there may be similarities in a relative manner (as in the case of authority and purity in non-WEIRD women and WEIRD women).

Generally, correlations for the Dark Triad traits with absolute moral foundations scores were positive, with some exceptions where there were no correlations at all. Positive relationships between the Dark Triad traits with absolute moral foundations were not consistent with previously reported results, where such relationships were mainly negative (Jonason et al., 2015; Karandikar et al., 2019). However, correlations of the Dark Triad traits with relative loyalty, authority, and purity were also positive, but with care and fairness, they were negative. These results suggest that people high on Dark Triad traits may declare that they value care and fairness, but these values may be for them less important than the other three moral foundations when they solve moral dilemmas. The Dark Triad traits were better predictors of the absolute importance of loyalty, authority, and purity; however, in the case of care and fairness, these traits predicted better relative scores. This discrepancy corresponds with the general distinction of moral foundations on individualizing and binding foundations (e.g., Graham et al., 2011). It also suggests that supplementing moral foundations research with

relative scores of moral foundations is a considerable contribution.

4.1. Limitations & conclusions

Our study is not free from limitations. First, the sample from Study 1 was a culturally and ethnically homogenous so-called WEIRD sample (Henrich et al., 2010). There is a possibility that we could obtain different results in more systematically collected non-WEIRD samples, as some research has suggested different patterns of moral judgments in non-WEIRD samples (Sorokowski et al., 2020; Turpin et al., 2021). However, we tried to solve this issue in Study 2, including data from WEIRD and non-WEIRD countries. Moreover, the Polish sample from Study 1 may combine features typical of WEIRD and non-WEIRD samples. Although the level of education, wealth, and industrialization in Poland is high, for other reasons, it is sometimes classified as a non-WEIRD country (Beyebach et al., 2021; Rogoza et al., 2021). Future studies should replicate our findings using even more diverse samples worldwide as well as check if participants from WEIRD countries as well as from non-WEIRD countries are similar within their country-type groups.

Second, both studies were based only on declarative answers to the questionnaires. Thus, we could not verify the obtained information, nor were we able to rule out that it might be biased from an unwillingness to provide some answers or lying, even though participation was anonymous. However, this is a common issue in moral and personality psychology studies where participants are asked about their values, opinions, or judgments. Future studies could solve this problem by experimental design, which indirectly measures moral foundations or by measuring moral foundations via real-life scenarios (Clifford et al., 2015). From this perspective, it may be interesting to check the correlations between relative scores on the MFQ and other psychological methods of measuring relative value, such as budget allocation (e.g., Li et al., 2002) or forced choice (e.g., Lishner et al., 2008).

Third, we used only two measures (i.e., attitudes towards science and the Dark Triad traits; Jach, 2021; Jones & Paulhus, 2014) to assess the nomological networks of absolute and relative moral values. We need more studies to understand how absolute and relative scores in MFQ may differentiate people in other domains. It may be interesting, for example, to examine the relationship between relative moral foundations and personality traits distinguished in the HEXACO model (Ashton & Lee, 2007), intrasexual competition (Albert et al., 2022), and utilitarian versus nonutilitarian modes of moral decision-making (Kahane et al., 2018).

We showed that supplementing absolute scores of moral foundations with relative scores provides additional information about an individual's moral compass, the sex differences in moral foundations, and relationships between moral foundations and attitudes towards science and the Dark Triad traits. Absolute scores on the MFQ give information about the levels of moral foundations, but relative scores may better reflect the context of everyday decisions when people are forced to decide about the importance of different moral foundations. Our method requires no more participants or questions and relies on an established measure, but it allows researchers to extract slightly different and additional information about individual differences in moral values. Just as the movements of the compass needle result from the forces acting on it, moral decisions can result from the importance of specific moral foundations.

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CRediT authorship contribution statement

Lukasz Jach: Conceptualization, Methodology, Formal analysis, Data curation, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Mariola Paruzel-Czachura:** Conceptualization, Methodology, Resources, Validation, Writing – original draft, Writing – review & editing. **Luke Aiken:** Conceptualization, Methodology, Formal analysis, Data curation, Project administration, Resources. **Peter K. Jonason:** Conceptualization, Methodology, Formal analysis, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.

Data availability

Data will be made available on request.

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