


Using the CNI Model to Investigate Individual Differences in Moral Dilemma Judgments

Personality and Social Psychology Bulletin
2020, Vol. 46(9) 1392–1407
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DOI: 10.1177/0146167220907203
journals.sagepub.com/home/pspb


Anita Körner^{1,2} , Roland Deutsch¹, and Bertram Gawronski³

Abstract

Typical moral dilemmas pitting the consequences of a given action against the action's consistency with moral norms confound several determinants of moral judgments. Dissociating these determinants, the CNI model allows researchers to quantify sensitivity to consequences, sensitivity to norms, and general preference for inaction over action regardless of consequences and norms. However, with the currently available set of dilemmas for research using the CNI model, the model is not suitable for studies with individual-difference designs. To overcome this limitation, the current research investigated the suitability of an extended dilemma battery to make the CNI model amenable for individual-difference research, examining relations of its parameters with psychopathy, empathic concern, need for cognition, self-reported utilitarianism, behavioral activation/inhibition, moral identity, and religiosity. The results support the suitability of the CNI model for individual-difference research with the extended dilemma battery, providing more nuanced insights into the underpinnings of individual differences in moral dilemma judgments.

Keywords

CNI model, deontology, individual differences, moral judgment, utilitarianism

Received August 23, 2019; revision accepted January 16, 2020

In the aftermath of the terrorist attacks on the Twin Towers in New York on September 11, 2001, people around the globe debated whether it would be acceptable to shoot down a hijacked passenger plane to prevent terrorists from crashing it into a densely populated area (Whitlock, 2006). Whereas some argued that it would be morally acceptable to kill innocent passengers on a hijacked plane to prevent greater harm, others argued that it would be immoral to kill innocent passengers regardless of how many lives would be saved. The former view can be described as *utilitarian* in the sense that the consequences of a given action for the greater good are deemed essential for the moral status of that action (i.e., shooting a hijacked passenger plane is acceptable from a utilitarian view if it prevents the death of a larger number of people). Conversely, the latter view can be described as *deontological* in the sense that the moral status of a given action is determined by its consistency with moral norms (i.e., shooting a hijacked passenger plane is unacceptable from a deontological view, because it violates the moral norm that one should not kill innocent people).

To understand the processes underlying utilitarian and deontological judgments, a substantial number of studies have investigated responses to moral dilemmas that pit one moral principle against the other (for a review see Bartels

et al., 2015). Research using this approach has also identified a broad range of person-related characteristics that are associated with individual differences in the preference for utilitarian versus deontological judgments (e.g., Gleichgerrcht & Young, 2013; McPhetres et al., 2018; Patil, 2015; van den Bos et al., 2011). The current research aims to provide a basis for more nuanced insights into the latter question using a mathematical modeling approach to quantify individual differences in (a) sensitivity to consequences, (b) sensitivity to moral norms, and (c) general preference for inaction over action regardless of consequences and norms in moral dilemma decisions (see Gawronski et al., 2017). The employed modeling approach allows going beyond mere demonstrations that a given individual-difference variable is associated with differences in the preference for utilitarian versus deontological judgments. Specifically, it clarifies

¹University of Würzburg, Germany

²University of Kassel, Germany

³The University of Texas at Austin, USA

Corresponding Author:

Anita Körner, University of Kassel, Holländische Str. 36-38, 34127 Kassel, Germany.

Email: anita.koerner@uni-kassel.de

whether observed associations are driven by differences in the sensitivity to consequences, differences in the sensitivity to norms, or differences in the general preference for inaction over action (or a combination of the three).

The Traditional Moral Dilemma Approach

In the traditional moral dilemma approach, participants are presented with a brief scenario in which they are asked to choose between two options, one of which is morally right from a utilitarian view and morally wrong from a deontological view, while the other is morally right from a deontological view and morally wrong from a utilitarian view. For example, in the well-known trolley dilemma (Foot, 1967), participants are told that a runaway trolley would kill a group of five workers unless a particular action is performed that would kill one person instead of five (e.g., pull a lever to redirect the trolley to another track). If participants judge the described action as acceptable, they are said to have made a “characteristically utilitarian” judgment (i.e., a judgment that maximizes the greater good). Conversely, if participants judge the described action as unacceptable, they are said to have made a “characteristically deontological” judgment (i.e., a judgment that is consistent with the moral norm that one should not kill innocent people).

Despite their widespread use in hundreds of studies, the trolley dilemma and its variants have been criticized for various suboptimal features, including their unrealistic and implausible scenarios (e.g., Bauman et al., 2014; Körner et al., 2019). Another concern is that the traditional dilemma approach treats utilitarian and deontological judgments as bipolar opposites, although their underlying processes are assumed to be independent (Conway & Gawronski, 2013). Moreover, whereas utilitarian judgments (e.g., pulling the lever) are typically conflated with action, deontological judgments (e.g., not pulling the lever) are typically conflated with inaction (Crone & Laham, 2017). Thus, the structural confounds in the traditional approach make it impossible to determine whether a given finding is driven by (a) differences in the sensitivity to consequences in a utilitarian sense, (b) differences in the sensitivity to norms in a deontological sense, or (c) differences in general action tendencies regardless of consequences and norms (Gawronski et al., 2016).

The significance of these concerns for individual-difference research can be illustrated with the finding that high levels of psychopathy are associated with a greater preference for utilitarian over deontological judgments in the traditional dilemma approach (e.g., Bartels & Pizarro, 2011; Kahane et al., 2015; Patil, 2015). Based on this finding, some researchers inferred a fundamental problem with sacrificial dilemmas, because it seems rather implausible that psychopaths aim to maximize overall well-being in a utilitarian sense (e.g., Kahane et al., 2015). Yet, others argued that the obtained association between psychopathy and moral

dilemma judgments reflects weaker deontological concerns about harmful actions among psychopaths (e.g., Conway et al., 2018). Finally, it is possible that psychopaths simply have a greater tendency to act regardless of consequences and moral norms (e.g., Gawronski et al., 2017). Any of these interpretations is consistent with the obtained association between psychopathy and moral dilemma judgments in the traditional approach, but it is not possible to distinguish between them because (a) utilitarian and deontological judgments are treated as bipolar opposites and (b) utilitarian judgments are conflated with action and deontological judgments are conflated with inaction (see Gawronski et al., 2016).

The CNI Model

To overcome these limitations, Gawronski et al. (2017) developed a mathematical model that allows researchers to quantify sensitivity to consequences (C), sensitivity to norms (N), and general preference for inaction over action regardless of consequences and norms (I) in responses to moral dilemmas. Their CNI model quantifies these three determinants based on responses to four kinds of moral dilemmas, capturing two orthogonal factors: whether a norm prohibits or prescribes action, and whether the benefits of the action are greater or lesser than the costs (for an example, see Table 1).

Because the statistical details of the CNI model are thoroughly explained by Gawronski et al. (2017), we will only summarize the general procedure. At its core, the CNI model consists of four mathematical equations that include the three model parameters (C , N , I) as unknowns and the empirically observed probabilities of *action* versus *inaction* responses on the four types of moral dilemmas as known numerical values (see Gawronski et al., 2017, Appendix B). Using a multinomial modeling approach (see Hütter & Klauer, 2016), these equations are used to quantify the extent to which participants’ judgments reflect a response pattern that is sensitive to consequences (first row in Figure 1), a response pattern that is sensitive to moral norms (second row in Figure 1), and a response pattern of general inaction versus general action irrespective of consequences and norms (third and fourth row in Figure 1). Higher C parameter scores reflect a greater sensitivity to consequences; higher N parameter scores reflect a greater sensitivity to moral norms; and higher I parameter scores reflect a greater general preference for inaction and lower scores reflect a greater general preference for action irrespective of consequences and moral norms.¹ The adequacy of the model in describing the data can be evaluated by means of goodness-of-fit statistics. Poor model fit would be reflected in a significant deviation between the empirically observed probabilities and the probabilities predicted by the model for this data set.

Research using the CNI model has provided valuable insights into the effects of cognitive resources (Gawronski et al., 2017), question framing (Gawronski et al., 2017),

Table 1. Example of a Moral Dilemma Involving Either a Proscriptive or a Prescriptive Norm Where the Benefits of Action Are Either Greater or Smaller Than the Costs of Action.

Norm	Benefits of action greater than costs	Benefits of action smaller than costs
Proscriptive norm prohibits action	You are the director of a hospital in a developing country. A foreign student who is volunteering in the country got infected with a rare virus. The virus is highly contagious and deadly to seniors and children. The only medication that can effectively stop the virus from spreading has severe side-effects. Although the virus will not kill her, the student suffers from a chronic immune deficiency that will make her die from these side-effects. Would you give the student the medication in this case?	You are the director of a hospital in a developing country. A foreign student who is volunteering in the country got infected with a rare virus. The virus is highly contagious and can cause severe stomach cramps. The only medication that can effectively stop the virus from spreading has severe side-effects. Although the virus will not kill her, the student suffers from a chronic immune deficiency that will make her die from these side-effects. Would you give the student the medication in this case?
Prescriptive norm prescribes action	You are the director of a hospital in a developing country. A foreign student who is volunteering in the country got infected with a rare virus. The virus is highly contagious and can cause severe stomach cramps. The student suffers from a chronic immune deficiency that will make her die from the virus if she is not returned to her home country for special treatment. However, taking her out of quarantine involves a considerable risk that the virus will spread. Would you take the student out of quarantine to return her to her home country for treatment in this case?	You are the director of a hospital in a developing country. A foreign student who is volunteering in the country got infected with a rare virus. The virus is highly contagious and deadly to seniors and children. The student suffers from a chronic immune deficiency that will make her die from the virus if she is not returned to her home country for special treatment. However, taking her out of quarantine involves a considerable risk that the virus will spread. Would you take the student out of quarantine to return her to her home country for treatment in this case?

Source. Reproduced from Gawronski et al. (2017). Reprinted with permission from the American Psychological Association.

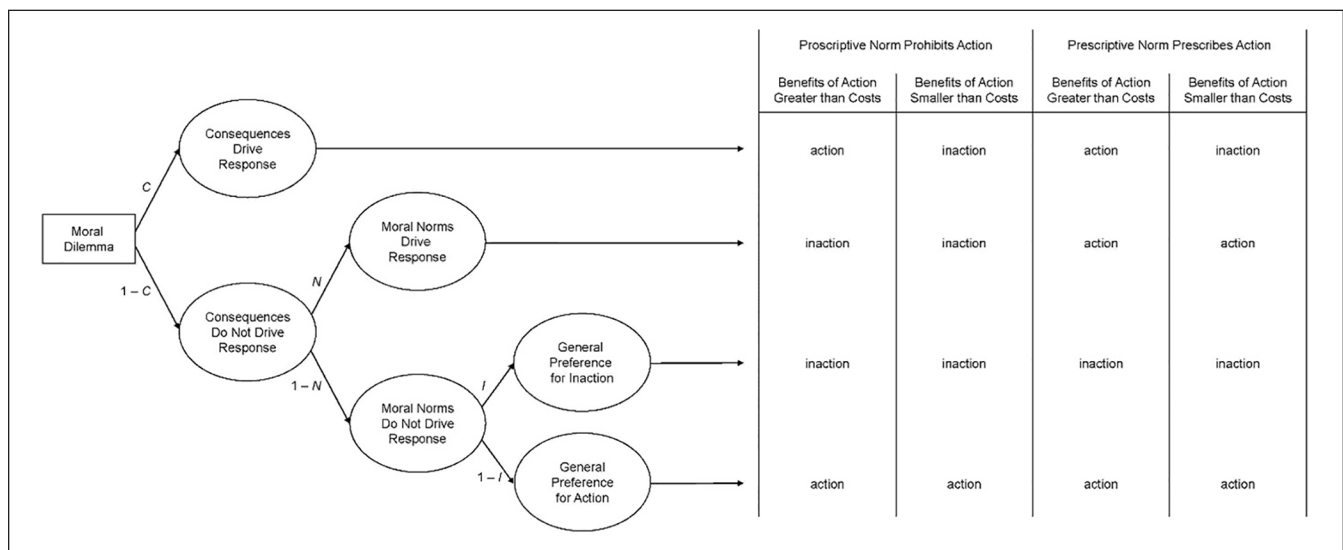


Figure 1. CNI model of moral decision-making predicting action versus inaction responses in moral dilemmas with proscriptive and prescriptive norms and consequences involving benefits of action that are either greater or smaller than costs of action.

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incidental emotions (Gawronski et al., 2018), testosterone (Brannon et al., 2019), language use (Białek et al., 2019), stress (Li et al., 2019; Zhang et al., 2018), and power (Gawronski & Brannon, 2020) on moral dilemma judgments. Of importance for the current question, findings obtained with the CNI model have also provided deeper insights into the association between psychopathy and moral dilemma judgments. Using an extreme-groups approach, Gawronski et al. (2017) found that participants high in psychopathy (i.e., participants with psychopathy scores in the highest quartile) differed from participants low in psychopathy (i.e., participants with psychopathy scores in the lowest quartile) on all three parameters of the CNI model. Specifically, participants high compared with low in psychopathy showed (a) a weaker sensitivity to consequences, (b) a weaker sensitivity to norms, and (c) a weaker general preference for inaction versus action. Thus, counter to descriptions of previous findings with the traditional approach, psychopaths are not “more utilitarian” (cf. Bartels & Pizarro, 2011; Kahane et al., 2015). If anything, the findings obtained with the CNI model suggest the opposite, in that psychopaths are less (not more) sensitive to consequences in a utilitarian sense—in addition to being less sensitive to norms in a deontological sense and more willing to act regardless of consequences and norms.

Despite its value in providing deeper insights into the determinants of moral dilemma judgments, the CNI model suffers from one major limitation. With the currently available set of dilemmas for research using the CNI model (i.e., six basic dilemmas in four variants), the model is well suited for studies involving comparisons between groups (e.g., experimental groups or groups with known features), but it is not suitable for research using individual-difference designs. In studies of the latter kind, the model would have to be run on the data of each individual participant (rather than aggregate data from groups of participants). However, with six observations per dilemma type, the number of observations is too small to obtain reliable parameter estimates at the individual level, which is reflected in poor model fit for a substantial proportion of participants and unreliable relations of the model parameters to other measures (for a detailed discussion, see Gawronski et al., 2017).

The Present Research

The aim of the current research was to overcome this limitation by developing and using a larger set of moral dilemmas for research using the CNI model. In a first step, we developed a new set of six basic dilemmas, with four variants of each basic dilemma varying in terms of consequences and norms (see Table 1). All dilemmas were designed to capture real-world cases that ignited moral debates about the most appropriate courses of action (see Gawronski et al., 2017) and to be equally plausible in all four versions (see Körner et al., 2019). In general, we aimed to create dilemmas where the

four versions are as similar as possible, the only difference being the nature of the focal norm and the outcome of the described action. To avoid conceptual ambiguities and confounds with other factors, we deliberately avoided scenarios involving self-relevant outcomes and interference with intentional actions of a third person (see Gawronski et al., 2017; Hennig & Hütter, 2020). A list of the new dilemma set is available at <https://osf.io/ndf4w/>.

In a second step, we conducted two pilot studies to investigate whether (a) the CNI model shows acceptable fit in describing participants' responses to our new dilemmas and (b) whether our new dilemmas reproduce experimental effects that have been found with Gawronski et al.'s (2017) dilemma set. Toward this end, participants were presented with our new set of moral dilemmas and asked to indicate either (a) whether it is morally acceptable to perform the described action (acceptability framing) or (b) whether they would perform the described action (action framing). Using the same framing manipulation, Gawronski et al. (2017) found that participants in the action-framing condition showed a weaker sensitivity to norms and a stronger general preference for inaction than participants in the acceptability-framing condition (see also Tassy et al., 2013). The two pilot studies largely replicated these findings, with acceptable model fit in each study (see supplemental materials). Although the effects of framing in the two individual studies were somewhat mixed, Gawronski et al.'s (2017) findings fully replicated in an integrative data analysis (Curran & Hussong, 2009) of the two pilot studies. Based on these findings, we conclude that (a) our newly developed dilemmas are psychologically similar to the dilemmas proposed by Gawronski et al. (2017) and, therefore, (b) the two dilemma sets can be combined to increase the number of responses per participant and dilemma type.

In a third step, we conducted four studies in which participants completed a battery of 48 moral dilemmas (12 basic dilemmas in four variants) comprising Gawronski et al.'s (2017) original dilemmas and our newly developed dilemmas. Before responding to the moral dilemmas, participants completed a battery of individual-difference measures that have been found to be associated with moral judgments in the traditional dilemma approach. Moral dilemma responses were analyzed with the CNI model at the individual level to investigate whether correlations between a given individual-difference measure and moral dilemma judgments are driven by (a) differences in sensitivity to consequences, (b) differences in sensitivity to norms, or (c) differences in general preference for inaction over action regardless of consequences and norms (or a combination of the three). To explore the generality of the obtained associations across question framings, participants in Studies 1a and 1b were asked to indicate whether they find the described action acceptable or unacceptable; participants in Studies 2a and 2b were asked to indicate whether or not they would perform the described action.

Table 2. Overview of Number of Exclusions for Each Criterion.

Number of cases per study	Study 1a	Study 1b	Study 2a	Study 2b
Requested MTurk payment	202	200	206	202
Provided correct completion code and received payment	200	200	200	200
Started study	178	204	209	208
Aborted study	2	1	5	7
Started study more than once	0	6	2	2
Essential data missing	0	0	1	0
Answered all dilemmas with same key	5	8	2	1
Failed attention check	10	12	3	9
Final sample size	161	177	196	189

We consider the CNI model amenable for individual-difference research with the extended dilemma set to the extent that two criteria are met. First, the proportion of participants for whom the CNI analysis yields significant deviations between predicted and observed responses should be close to chance level (i.e., 5% with an Alpha criterion of $p < .05$). Second, previous results with the CNI model should replicate², specifically the extreme-groups result concerning the negative relations between psychopathy and the three model parameters (see Gawronski et al., 2017). To the extent that both criteria are met, the CNI model can be further evaluated for its capacity to provide more nuanced insights into the underpinnings of individual differences in moral dilemma judgments.³

Based on concerns about the reproducibility of psychological findings (Open Science Collaboration, 2015), we conducted one initial study and one replication for each question framing. For each study, we aimed to recruit 200 participants, which provides a statistical power of .80 to detect a small to medium-sized correlation of $r = .20$ (two-tailed) in line with previously observed correlations between dilemma judgments and dispositional measures. By default, we excluded participants who aborted the study or started it more than once, participants with missing data in the essential components of the study (i.e., individual-difference measures, moral dilemmas), participants who showed the same response to all dilemmas, and participants who failed to pass an instructional attention check (see Oppenheimer et al., 2009; for details on numbers of participant exclusions per criterion for each study, see Table 2). The data for each study were collected in one shot without intermittent statistical analyses. We report all measures, all conditions, and all data exclusions. The data, analysis codes, and materials for all studies are available at <https://osf.io/ndf4w/>.

Table 3 provides a list of the individual-difference measures in the current studies, including a brief description of previous findings with the traditional dilemma approach. The present research examines to which extent associations between individual-difference measures and dilemma judgments are driven by (a) differences in the sensitivity to consequences, which should be reflected in correlations with

the C parameter, (b) differences in the sensitivity to moral norms, which should be reflected in correlations with the N parameter, and (c) differences in the general preference for inaction over action regardless of consequences and norms, which should be reflected in correlations with the I parameter.

Studies 1a and 1b

Studies 1a and 1b investigated relations between the individual-difference dimensions listed in Table 3 and the three parameters of the CNI model. Participants in both studies were asked to indicate whether they find the described action acceptable or unacceptable.

Method

Participants. Participants were recruited for a study entitled *How Do We Make Moral Decisions?* via Amazon's Mechanical Turk (MTurk). Participants received compensation of US\$4.00 for completing the study. Eligibility for participation was limited to English native speakers who (a) had a human intelligence tasks (HIT) approval rate of at least 95% at the time of the study and (b) had not participated in prior studies from our lab using the same moral dilemmas.

Of the 178 participants who started Study 1a, 17 were excluded from all analyses (for details on data exclusions, see Table 2), leaving us with a final sample of 161 participants for Study 1a (72 females, 84 males; $M_{\text{age}} = 37$ years, $SD_{\text{age}} = 11$; demographic information missing for five participants).⁴

Of the 204 participants who started Study 1b, 27 were excluded from all analyses (for details on data exclusions, see Table 2), leaving us with a final sample of 177 participants for Study 1b (65 females, 105 males, two others, four prefer not to respond; $M_{\text{age}} = 33$ years, $SD_{\text{age}} = 9$; demographic information missing for one participant).

Measures. Before responding to the moral dilemmas, participants completed a battery of individual-difference measures in the following order. Behavioral activation and behavioral

Table 3. List of Individual-Difference Measure Included in the Current Studies, Previously Obtained Associations With Preference for Utilitarian Over Deontological Judgments in the Traditional Dilemma Approach, and Sample References for the Described Findings.

Individual-difference construct	Finding with traditional dilemma approach	Sample reference
Psychopathy	Higher level of psychopathy associated with stronger preference for utilitarian over deontological judgments	Bartels & Pizarro (2011)
Empathic concern	Higher levels of empathic concern associated with weaker preference for utilitarian over deontological judgments	Gleichgerrcht & Young (2013)
Need for cognition	Higher levels of need for cognition associated with stronger preference for utilitarian over deontological judgments	Conway & Gawronski (2013)
Oxford Utilitarianism Scale: impartial beneficence	Higher levels of impartial beneficence associated with preference for utilitarian over deontological judgments	Kahane et al. (2018)
Oxford Utilitarianism Scale: instrumental harm	Higher levels of instrumental harm associated with stronger preference for utilitarian over deontological judgments	Kahane et al. (2018)
Behavioral inhibition	Higher levels of behavioral inhibition associated with weaker preference for utilitarian over deontological judgments	van den Bos et al. (2011)
Behavioral activation	Higher levels of behavioral activation associated with stronger preference for utilitarian over deontological judgments	Moore et al. (2011)
Self-importance of moral identity: internalization	Higher internalization of self-importance of moral identity associated with weaker preference for utilitarian over deontological judgments	Glenn et al. (2010)
Religiosity	Higher levels of religiosity associated with weaker preference for utilitarian over deontological judgments	Szekely et al. (2015)

inhibition were measured with Carver and White's (1994) behavioral inhibition system (BIS)/behavioral approach system (BAS) inventory.⁵ Need for cognition (NFC) was assessed with the NFC subscale of the Rational-Experiential Inventory (Epstein et al., 1996). Impartial beneficence and instrumental harm were measured with the Oxford Utilitarianism Scale (OUS; Kahane et al., 2018).⁶ Empathic concern was measured with the corresponding subscale of the Interpersonal Reactivity Index (Davis, 1983). Psychopathy was assessed with Levenson et al.'s (1995) Primary Psychopathy Scale. Self-importance of moral identity internalization (for the sake of brevity hereafter called moral identity internalization) was measured with the internalization subscale of the Self-Importance of Moral Identity Scale (Aquino & Reed, 2002). Religiosity was assessed with a modified variant of Koenig et al. (2005) Religiousness Scale, adapted from Conway and Gawronski (2013).

After completing the battery of individual-difference measures, participants responded to 48 moral dilemmas (12 basic dilemmas each presented in four variants) in a fixed randomized order. Participants were asked to indicate for each dilemma whether it is acceptable to perform the described action (*yes* vs. *no*). Finally, participants provided demographic information, responded to a one-item instructional attention check (see Oppenheimer et al., 2009), and were given an opportunity to comment on the study before receiving a completion code to request their compensation.

Results and Discussion

Responses on the individual-difference measures were aggregated by reverse coding negatively framed items and calculating scores according to the instructions provided in the original publications (see Table 4 for estimates of internal consistency and interitem correlations). The moral judgment data were aggregated by calculating the sum of *action* responses to the four types of moral dilemmas for each participant. With a total of 12 scenarios for each dilemma type, aggregate scores could range from 0 to 12. Mean values and 95% confidence intervals of the aggregated moral judgment data are presented in Table 5. Based on the resulting scores for the four kinds of dilemmas, individual parameter scores of sensitivity to consequences (*C*), sensitivity to norms (*N*), and general preference for inaction over action regardless of consequences and norms (*I*) were estimated with the freeWare multiTree (Moshagen, 2010) by fitting the CNI model to the aggregated moral judgment data of each participant.⁷

The model fit the data for 95.0% of the participants in Study 1a and 94.4% of the participants in Study 1b. With an alpha-criterion of $p = .05$ for significant deviations between predicted and observed probabilities of *action* versus *inaction* responses, the observed proportions of participants for whom the model did not fit (i.e., 5.0% and 5.6%, respectively) are perfectly in line with the statistically to-be-expected false-positive rate of 5%. These results provide preliminary evidence that the extended set of moral dilemmas is adequate for

Table 4. Cronbach's Alphas and Minimum, Maximum as Well as Mean Interitem Correlations for Each Measure.

Individual-difference measure	Cronbach's alphas				Interitem correlations							
					Min; Max		Min; Max		Min; Max		Min; Max	
	1a	1b	2a	2b	1a	1b	2a	2b	1a	1b	2a	2b
Psychopathy	.920	.935	.914	.929	.081; .733	.068; .819	.131; .804	.123; .806	.411	.459	.397	.438
Empathic concern	.888	.889	.901	.862	.321; .753	.297; .808	.274; .791	.269; .739	.533	.541	.563	.480
Need for cognition	.875	.847	.876	.819	.395; .792	.307; .871	.300; .831	.235; .794	.587	.524	.585	.475
OUS: impartial beneficence	.797	.830	.719	.818	.336; .545	.392; .759	.157; .521	.370; .642	.440	.494	.339	.474
OUS: instrumental harm	.838	.875	.783	.788	.434; .692	.522; .706	.334; .634	.375; .550	.560	.637	.475	.484
Behavioral inhibition	.880	.850	.849	.803	.415; .675	.254; .657	.302; .649	.215; .654	.514	.451	.446	.374
Behavioral activation	.865	.854	.828	.831	-.019; .577	-.039; .614	.005; .653	.002; .541	.331	.310	.271	.277
Moral identity internalization	.765	.779	.789	.767	.009; .752	.028; .791	.133; .763	.090; .818	.411	.429	.430	.424

Note. Min = minimum; Max = maximum; OUS = Oxford Utilitarianism Scale.

Table 5. Mean Values and 95% Confidence Intervals of Action (vs. Inaction) Responses on Moral Dilemmas With Proscriptive and Prescriptive Norms and Consequences Involving Benefits of Action That Are Either Greater or Smaller Than Costs of Action. Scores Can Range From 0 to 12.

Study	Proscriptive norm prohibits action				Prescriptive norm prescribes action			
	Benefits of action greater than costs		Benefits of action smaller than costs		Benefits of action greater than costs		Benefits of action smaller than costs	
	M	95% CI	M	95% CI	M	95% CI	M	95% CI
Study 1a	4.97	[4.57, 5.37]	2.81	[2.37, 3.26]	9.27	[8.94, 9.60]	7.12	[6.75, 7.50]
Study 1b	5.33	[4.92, 5.75]	3.25	[2.80, 3.69]	9.33	[8.99, 9.67]	7.29	[6.94, 7.64]
Study 2a	4.60	[4.26, 4.94]	2.40	[2.08, 2.71]	9.26	[8.97, 9.55]	6.51	[6.17, 6.84]
Study 2b	5.21	[4.81, 5.61]	3.20	[2.79, 3.60]	8.65	[8.31, 8.98]	6.39	[6.02, 6.77]

Note. The neutral reference value of equal numbers of action and inaction responses is 6. CI = confidence interval.

CNI model analyses at the individual level (see supplemental materials, Tables S7 and S12, for the results of analyses after excluding participants for whom the CNI model did not fit; and see supplemental materials, Tables S6 and S11, for the results after excluding participants for whom the CNI modeling yielded an error message). Mean values and standard deviations of the estimated parameter scores are presented in Table 6. Correlations between the three parameter scores and the individual-difference measures are presented in Table 7 (Study 1a) and Table 8 (Study 1b). Tables 7 and 8 also include correlations between the individual-difference measures and traditional dilemma scores reflecting the relative preference for utilitarian over deontological judgments on dilemmas involving a norm that prohibits action where the benefits of action outweigh its costs to well-being (see supplemental materials, Tables S3 and S8, for a complete table of correlations among all measures).

Psychopathy. Replicating previous findings, traditional dilemma scores showed a significant positive correlation

with psychopathy in both Study 1a and Study 1b, indicating an increasing preference for utilitarian over deontological judgments as a function of increasing psychopathy scores. Moreover, replicating findings of previous research with the CNI model using an extreme-groups approach, psychopathy was negatively correlated with all three model parameters. Specifically, higher psychopathy was associated with a weaker sensitivity to consequences on the *C* parameter, a weaker sensitivity to norms on the *N* parameter, and a weaker general preference for inaction over action on the *I* parameter. These results were consistent across Study 1a and Study 1b, the only exception being a marginal correlation between psychopathy and the *I* parameter in Study 1b. Together, these results provide further support the suitability of the CNI model for individual-difference research with our extended moral dilemma battery.⁸

Empathic concern. Consistent with earlier findings, empathic concern was negatively correlated with traditional dilemma scores in Study 1b, but this finding did not emerge in Study

Table 6. Mean Values and Standard Deviations for Sensitivity to Consequences (C Parameter), Sensitivity to Norms (N Parameter), and General Preference for Inaction Over Action Regardless of Consequences and Norms (I Parameter).

Study	C parameter		N parameter		I parameter	
	M	SD	M	SD	M	SD
Study 1a	.190	0.19	.481	0.32	.551	0.27
Study 1b	.183	0.17	.453	0.33	.476	0.30
Study 2a	.213	0.17	.495	0.32	.595	0.26
Study 2b	.192	0.18	.383	0.31	.556	0.25

Table 7. Correlations Between Individual-Difference Measures and Moral Dilemma Judgments, as Reflected in Relative Preference for Utilitarian Over Deontological Judgments (Traditional Score), Sensitivity to Consequences (C Parameter), Sensitivity to Norms (N Parameter), and General Preference for Inaction Over Action Regardless of Consequences and Norms (I Parameter), Study 1a.

Individual-difference measure	Traditional score		C parameter		N parameter		I parameter	
	r	p	r	p	r	p	r	p
Psychopathy	.322	<.001	-.357	<.001	-.613	<.001	-.299	<.001
Empathic concern	-.116	.114	.144	.151	.235	.003	.070	.381
Need for cognition	-.144	.068	.166	.035	.261	.001	.062	.435
OUS: impartial beneficence	.203	.010	-.190	.016	-.298	<.001	-.287	<.001
OUS: instrumental harm	.393	<.001	-.142	.072	-.510	<.001	-.192	.015
Behavioral inhibition	-.034	.671	.032	.691	.067	.398	-.009	.912
Behavioral activation	.178	.024	-.071	.373	-.184	.019	-.180	.023
Moral identity internalization	-.251	.001	.170	.031	.415	<.001	.125	.114
Religiosity	.038	.629	-.200	.011	-.104	.187	-.047	.550

Note. Traditional score reflects relative preference for utilitarian over deontological judgments on dilemmas involving a proscriptive norm that prohibits action in cases where the benefits of action outweigh its costs to well-being. Higher scores on this score reflect a greater preference for utilitarian over deontological judgments. OUS = Oxford Utilitarianism Scale.

Table 8. Correlations Between Individual-Difference Measures and Moral Dilemma Judgments, as Reflected in Relative Preference for Utilitarian Over Deontological Judgments (Traditional Score), Sensitivity to Consequences (C Parameter), Sensitivity to Norms (N Parameter), and General Preference for Inaction Over Action Regardless of Consequences and Norms (I Parameter), Study 1b.

Individual-difference measure	Traditional score		C parameter		N parameter		I parameter	
	r	p	r	p	r	p	r	p
Psychopathy	.405	<.001	-.252	.001	-.595	<.001	-.143	.057
Empathic concern	-.244	.001	.047	.532	.175	.020	.153	.042
Need for cognition	-.205	.006	.115	.128	.270	<.001	.095	.209
OUS: impartial beneficence	.257	.001	-.078	.301	-.348	<.001	-.010	.891
OUS: instrumental harm	.546	<.001	-.037	.627	-.561	<.001	-.273	<.001
Behavioral inhibition	.095	.210	.144	.055	.053	.487	-.038	.612
Behavioral activation	.121	.109	-.279	<.001	-.357	<.001	-.040	.599
Moral identity internalization	-.420	<.001	.154	.040	.430	<.001	.231	.002
Religiosity	.119	.114	-.350	<.001	-.235	.002	-.181	.016

Note. Traditional score reflects relative preference for utilitarian over deontological judgments on dilemmas involving a proscriptive norm that prohibits action in cases where the benefits of action outweigh its costs to well-being. Higher scores on this score reflect a greater preference for utilitarian over deontological judgments. OUS = Oxford Utilitarianism Scale.

1a. More fine-grained analyses with the CNI model revealed a positive relation between empathic concern and the N parameter in both Study 1a and Study 1b, suggesting that greater empathic concern is associated with a stronger sensitivity to norms. Empathic concern also showed a significant

positive correlation with the I parameter in Study 2b but this relation did not emerge in Study 2a.

NFC. Different from previous findings suggesting a positive relation between NFC and traditional dilemma scores, NFC

showed a marginal negative correlation with traditional dilemma scores in Study 1a and a significant negative correlation in Study 1b. Further analyses suggest that these relations were driven by a stronger sensitivity to norms among participants high in NFC, as reflected in significant positive correlations between NFC and the *N* parameter. Consistent with the idea that higher NFC is associated with enhanced analyses of costs and benefits, NFC showed a significant positive correlation with the *C* parameter in Study 1a, but this finding did not replicate in Study 1b.

OUS. Replicating previous findings, the traditional dilemma score showed significant positive correlations with the impartial beneficence and instrumental harm dimensions of the OUS in both Study 1a and Study 1b. Surprisingly, further analyses with the CNI model suggest that these correlations were largely driven by a weaker sensitivity to norms among participants high in impartial beneficence and participants high in instrumental harm, as reflected in significant negative correlations with the *N* parameter. If anything, impartial beneficence was negatively related to sensitivity to consequences, but the relevant correlation with the *C* parameter was significant only in Study 1a, but not in Study 1b. In addition, instrumental harm showed a significant negative relation with general preference for inaction on the *I* parameter in both Study 1a and Study 1b. A similar pattern was obtained for impartial beneficence, but its correlation with the *I* parameter was significant only in Study 1a, but not in Study 1b.

BIS/BAS. Different from previous research, neither Study 1a nor Study 1b revealed a significant negative correlation between BIS scores and traditional dilemma scores. BAS scores showed a significant positive correlation with traditional dilemma scores in Study 1a, but this finding did not replicate in Study 1b. On a more fine-grained level, BAS scores showed a significant negative correlation with the *N* parameter in both Study 1a and Study 1b, suggesting that greater behavioral activation is associated with reduced sensitivity to norms. There was also a significant negative correlation between BAS and the *I* parameter in Study 1a and a significant negative correlation between BAS and the *C* parameter in Study 1b, but neither of these findings replicated in the respective other study.

Moral identity internalization. Consistent with previous findings, both Study 1a and Study 1b revealed significant negative correlations between moral identity internalization and traditional dilemma scores. Further analyses revealed that this association is driven by a positive association between moral identity internalization and sensitivity to norms captured by the *N* parameter. Interestingly, moral identity internalization also showed significant positive correlations with the *C* parameter in both studies, suggesting that more pronounced a moral identity internalization is associated with a stronger sensitivity to consequences. In Study 1b, moral

identity internalization additionally showed a significant positive correlation with the *I* parameter, but this finding did not emerge in Study 1a.

Religiosity. Different from previous findings, religiosity was not significantly related to traditional dilemma scores in either Study 1a or Study 1b. However, more fine-grained analyses with the CNI model revealed a significant negative correlation between religiosity and the *C* parameter in both Study 1a and Study 1b, suggesting that greater religiosity is associated with weaker sensitivity to consequences. In Study 1b, religiosity additionally showed significant negative correlations with the *N* and the *I* parameters, but these relations did not emerge in Study 1a.

Studies 2a and 2b

Studies 2a and 2b investigated relations between the individual-difference dimensions listed in Table 3 and the three parameters of the CNI model using action framing instead of the acceptability framing used in Studies 1a and 1b (see Gawronski et al., 2017; Tassy et al., 2013). Given that action framing influenced overall scores on the *N* and the *I* parameters in Gawronski et al.'s (2017) dilemma set as well as our newly developed dilemma set (see supplemental materials), we investigated whether the obtained shifts in mean scores at the group level affect correlations with individual-difference measures (see Funder, 2006, for a discussion of the relation between mean-level and individual-difference effects).

Method

Participants. Participants were recruited for a study entitled *How Do We Make Moral Decisions?* via Amazon's Mechanical Turk (MTurk). Participants received compensation of US\$4.00 for completing the study. Eligibility for participation was limited to English native speakers who (a) had a HIT approval rate of at least 95% at the time of the study and (b) had not participated in prior studies from our lab using the same moral dilemmas.

Of the 209 participants who started Study 2a, 13 were excluded from all analyses (for details on data exclusions, see Table 2), leaving us with a final sample of 196 participants for Study 2a (102 females, 93 males; $M_{\text{age}} = 35$ years, $SD_{\text{age}} = 10$; demographic information missing for one participant).

Of the 208 participants who started Study 1a, 19 were excluded from all analyses (for details on data exclusions, see Table 2), leaving us with a final sample of 189 participants for Study 2b (90 females, 96 males, two other, one prefer not to respond; $M_{\text{age}} = 34$ years, $SD_{\text{age}} = 9$).

Measures. The individual-difference measures and moral dilemmas were identical to Studies 1a and 1b, the only difference being that participants were asked to indicate whether

Table 9. Correlations Between Individual-Difference Measures and Moral Dilemma Judgments, as Reflected in Relative Preference for Utilitarian Over Deontological Judgments (Traditional Score), Sensitivity to Consequences (*C* Parameter), Sensitivity to Norms (*N* Parameter), and General Preference for Inaction Over Action Regardless of Consequences and Norms (*I* Parameter), Study 2a.

Individual-difference measure	Traditional score		<i>C</i> parameter		<i>N</i> parameter		<i>I</i> parameter	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Psychopathy	.264	<.001	-.224	.002	-.494	<.001	-.219	.002
Empathic concern	-.151	.035	-.051	.479	.246	.001	-.023	.749
Need for cognition	-.035	.630	.077	.281	.077	.281	.027	.709
OUS: impartial beneficence	.158	.027	-.202	.005	-.172	.016	-.186	.009
OUS: instrumental harm	.391	<.001	.023	.752	-.411	<.001	-.145	.042
Behavioral inhibition	.027	.703	.157	.028	.167	.019	-.014	.844
Behavioral activation	.044	.542	-.119	.097	-.050	.490	-.100	.163
Moral identity internalization	-.180	.012	.107	.136	.347	<.001	.087	.226
Religiosity	-.069	.334	-.146	.042	.101	.159	.011	.877

Note. Traditional score reflects relative preference for utilitarian over deontological judgments on dilemmas involving a proscriptive norm that prohibits action in cases where the benefits of action outweigh its costs to well-being. Higher scores on this score reflect a greater preference for utilitarian over deontological judgments. OUS = Oxford Utilitarianism Scale.

they would perform the described actions in the moral dilemmas (*yes vs. no*).

Results and Discussion

The data were aggregated in line with the procedures in Studies 1a and 1b. Estimates of internal consistency for the individual-difference measures are presented in Table 4. Mean values and 95% confidence intervals of the aggregated moral judgment data are presented in Table 5. The CNI model fit the data for 96.9% of the participants in Study 2a and 94.7% of the participants in Study 2b. With an alpha-criterion of $p = .05$ for significant deviations between predicted and observed probabilities of *action* versus *inaction* responses, the observed proportions of participants for whom the model did not fit (i.e., 3.1% and 5.3%, respectively) are again in line with the statistically to-be-expected false-positive rate of 5% (see supplemental materials, Tables S17 and S22, for the results of analyses after excluding participants for whom the CNI model did not fit; and see supplemental materials, Tables S16 and S21, for the results after excluding participants for whom the CNI modeling yielded an error message). Mean values and standard deviations of the estimated parameter scores are presented in Table 6. Correlations between the three parameter scores, traditional dilemma scores, and the individual-difference measures are presented in Table 9 for Study 2a and in Table 10 for Study 2b (see supplemental materials, Tables S13 and S18, for a complete table of correlations among all measures).⁹

Psychopathy. Replicating the findings of Studies 1a and 1b, psychopathy showed a significant positive correlation with traditional dilemma scores, and significant negative correlations with all three parameters of the CNI model in both Study 2a and Study 2b.¹⁰

Empathic concern. Consistent with earlier findings and the results of Study 1b, empathic concern showed a significant negative correlation with traditional dilemma scores in both Study 2a and Study 2b. Replicating the findings of Studies 1a and 1b, analyses with the CNI model suggest that this relation is driven by a stronger sensitivity to norms among participants high in empathic concern, as empathic concern and the *N* parameter were positively correlated in both Study 2a and Study 2b. Similar to the unreliable positive relation between empathic concern and general action tendencies in Study 1b (which did not emerge in Study 1a), empathic concern showed a significant positive correlation with the *I* parameter in Study 2b, but not in Study 2a.

NFC. Study 2b replicated the negative relation between NFC and traditional dilemma scores in Studies 1a and 1b, but this relation was not statistically significant in Study 2a. Similarly, Study 2b replicated the positive relation between NFC and the *N* parameter in Studies 1a and 1b, but this relation was also not significant in Study 2a.

OUS. Replicating earlier findings and the pattern obtained in Studies 1a and 1b, traditional dilemma scores showed significant positive correlations with impartial beneficence and instrumental harm in Studies 2a and 2b. Further analyses with the CNI model suggest that these correlations are largely driven by a weaker sensitivity to norms among participants high in impartial beneficence and participants high in instrumental harm, replicating the pattern obtained in Studies 1a and 1b. The two dimensions also showed negative relations with general preference for inaction over action in both studies, replicating the overall pattern in Study 1a and the pattern for instrumental harm in Study 1b. In Study 2a, impartial beneficence showed a significant negative correlation with the *C* parameter (similar to Study 1a), but this relation did not replicate in Study 2b.

Table 10. Correlations Between Individual-Difference Measures and Moral Dilemma Judgments, as Reflected in Relative Preference for Utilitarian Over Deontological Judgments (Traditional Score), Sensitivity to Consequences (*C* Parameter), Sensitivity to Norms (*N* Parameter), and General Preference for Inaction Over Action Regardless of Consequences and Norms (*I* Parameter), Study 2b.

Individual-difference measure	Traditional score		<i>C</i> parameter		<i>N</i> parameter		<i>I</i> parameter	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Psychopathy	.355	<.001	-.194	.007	-.575	<.001	-.211	.004
Empathic concern	-.323	<.001	.022	.767	.384	<.001	.164	.024
Need for cognition	-.149	.040	.099	.176	.232	.001	.112	.126
OUS: impartial beneficence	.203	.005	-.086	.238	-.194	.008	-.138	.059
OUS: instrumental harm	.498	<.001	-.029	.694	-.534	<.001	-.239	.001
Behavioral inhibition	-.141	.052	.084	.248	.165	.024	.098	.178
Behavioral activation	.143	.049	.004	.951	-.149	.041	-.110	.132
Moral identity internalization	-.330	<.001	.199	.006	.466	<.001	.238	.001
Religiosity	.071	.331	-.237	.001	-.093	.201	-.170	.019

Note. Traditional score reflects relative preference for utilitarian over deontological judgments on dilemmas involving a proscriptive norm that prohibits action in cases where the benefits of action outweigh its costs to well-being. Higher scores on this score reflect a greater preference for utilitarian over deontological judgments. OUS = Oxford Utilitarianism Scale.

BIS/BAS. Similar to the unreliable positive relation between BAS and traditional dilemma scores in Study 1a (which did not replicate in Study 1b), BAS was positively correlated with traditional dilemma scores in Study 2b, but not in Study 2a. More fine-grained analyses with the CNI model revealed a significant positive relation between BIS and sensitivity to norms on the *N* parameter in both Study 2a and Study 2b. There was also a significant positive correlation between BIS and the *C* parameter in Study 2a and a significant negative correlation between BAS and the *N* parameter in Study 2b, but neither of these relations replicated in the respective other study.

Moral identity internalization. Replicating the findings of Studies 1a and 1b, moral identity internalization showed a significant negative correlation with traditional dilemma scores in both Study 2a and Study 2b. Again, analyses with the CNI model suggest that this association is driven by a greater sensitivity to norms among participants high in moral identity internalization, as moral identity internalization and the *N* parameter were positively correlated in both Study 2a and Study 2b. In Study 2b, moral identity internalization also showed significant positive correlations with the *C* and the *I* parameters, but these relations did not emerge in Study 2a.

Religiosity. Consistent with the findings of Studies 1a and 1b, religiosity was not significantly related to traditional dilemma scores. Yet, replicating the pattern in Studies 1a and 1b, religiosity showed a significant negative correlation with sensitivity to consequences on the *C* parameter in both Study 2a and Study 2b. Similar to the unreliable negative relation between religiosity and general action tendencies in Study 1b (which did not emerge in Study 1a), religiosity showed a significant negative relation with the *I* parameter in Study 2b, but not in Study 2a.

Integrative Data Analysis

The obtained pattern of correlations was very similar for the two question framings. Indeed, when we combined the data from the four studies for an integrative data analysis (Curran & Hussong, 2009) and compared the correlations of the three parameters with each of the employed individual-difference measures, only two of the 27 correlations were significantly different across question framings. First, BAS showed a stronger negative relation with sensitivity to norms for acceptability framing, $r(336) = -.276$, than for action framing, $r(383) = -.114$, $z = 2.256$, $p = .024$. Second, religiosity showed a stronger negative association with sensitivity to norms for acceptability framing, $r(336) = -.168$, than for action framing, $r(383) = .009$, $z = 2.386$, $p = .018$. None of the other correlations were significantly different across question framings. Although assignment to the two framings was not random and inferences from null effects should be treated with caution, these results suggest that the obtained effects of question framing on the overall size of parameters scores have little impact on their correlation with measures of individual differences (see Funder, 2006).

General Discussion

The aim of the current research was to overcome a major limitation of the CNI model. With the previously available set of dilemmas, the CNI model is well suited for studies involving comparisons between groups (e.g., experimental groups or groups with known features), but it is not suitable for research using individual-difference designs (see Gawronski et al., 2017). For the latter type of research, the number of observations per dilemma type is too small to provide reliable parameter estimates at the individual level, which is reflected in poor model fit for a substantial proportion of participants and unreliable relations of the model

parameters to other measures. To address this limitation, we developed a new set of moral dilemmas and combined it with the existing set of dilemmas for research using the CNI model (see Gawronski et al., 2017).

Using this extended dilemma battery, we found the CNI model amenable for individual-difference studies in terms of our two criteria. First, in all four studies, the CNI model fit the data well for approximately 95% of our participants. With an alpha-criterion of $p = .05$ for deciding whether a modeling deviation is significant, these results are in line with the to-be-expected proportion of false positives if the hypothesis of no significant model deviation is true. Second, in all four studies, we replicated previous results using the CNI model, specifically the negative relations between psychopathy and the three model parameters (see Gawronski et al., 2017). Although not a new finding, this replication suggests that our extended dilemma battery retains the properties of Gawronski et al.'s (2017) dilemmas for research using the CNI model, which is crucial for evaluating our individual-difference approach. From these results, we conclude that the CNI model is amenable for individual-difference analyses with our extended dilemma battery. Expanding on this conclusion, we further investigated correlations between the three parameters of the CNI model and a broad range of theoretically relevant individual-difference measures, illustrating the deeper insights that can be gained from using the CNI model in research on individual differences in moral dilemma judgments.

Psychopathy

Replicating earlier findings (e.g., Bartels & Pizarro, 2011; Kahane et al., 2015; Patil, 2015), we found that psychopathy was positively related to preference for utilitarian over deontological judgments in traditional dilemma scores. However, more fine-grained analyses with the CNI model indicate that it would be ill-founded to interpret this relation as evidence for greater “utilitarianism” among psychopaths, given that higher levels of psychopathy were associated with weaker (not stronger) sensitivity to consequences in all four studies. In addition, psychopathy showed negative correlations with sensitivity to norms and general preference for inaction over action in all four studies. These results support the reliability of previously obtained associations between psychopathy and the three CNI parameters using comparisons between extreme groups (Gawronski et al., 2017), which can lead to artifacts and misleading results (see MacCallum et al., 2002). In doing so, the current findings corroborate the proposition that the CNI model offers nuanced insights into the association between psychopathy and moral judgment that cannot be gained with the traditional approach.

Empathic Concern

Several studies have found a negative relation between empathic concern and preference for utilitarian over

deontological judgments in traditional dilemma scores (e.g., Gleichgerrcht & Young, 2013; Patil & Silani, 2014). We replicated this finding in three of four studies. More fine-grained analyses with the CNI model suggest that this relation is driven by a stronger sensitivity to norms among people high in empathic concern, as reflected in a significant positive correlation between empathic concern and the N parameter in all four studies. In two of the four studies, we also found a significant positive correlation between empathic concern and general preference for inaction over action (Studies 1b and 2b), but given the low reliability of this relation we refrain from drawing any conclusions from this finding. Overall, our results suggest that greater empathy reduces preference for utilitarian over deontological judgments via increased norm sensitivity.

NFC

In contrast to some earlier studies suggesting a positive relation between NFC and preference for utilitarian over deontological judgments in traditional dilemma scores (e.g., Conway & Gawronski, 2013; Wiech et al., 2013; but see Patil et al., 2020), we found a significant negative correlation in Studies 1b and 2b and a marginal negative correlation in Study 1a. More fine-grained analyses with the CNI model suggest that this relation is driven by a greater sensitivity to norms among people high in NFC, in that NFC showed a significant positive correlation with the N parameter in three of the four studies. Although the inconsistency between the current and previous findings require future research on the relation between NFC and moral dilemma judgments, the current findings pose a challenge to the idea that high NFC is associated with more deliberate analyses of costs and benefits in a utilitarian sense (cf. Greene et al., 2001). Instead, our findings suggest that NFC influences moral dilemma judgments via enhanced reflection about moral norms. This conclusion is in line with other recent findings indicating that the impact of deliberation on moral dilemma judgments is much more complex than suggested by the dominant assumption that high deliberation invariably increases concerns about outcomes (e.g., Byrd & Conway, 2019; Patil et al., 2020; see also Körner & Volk, 2014).

OUS

Replicating previous findings (e.g., Kahane et al., 2018), we found that both impartial beneficence and instrumental harm were positively related to preference for utilitarian over deontological judgments in traditional dilemma scores. These relations replicated in all four studies. However, different from an interpretation of these relations as reflecting individual differences in utilitarian reasoning about consequences, more fine-grained analyses with the CNI model suggest that they are mainly driven by individual differences in the sensitivity to norms. Across all four studies, impartial beneficence and

instrumental harm were negatively correlated with the N parameter, suggesting a weaker sensitivity to norms among people scoring high in impartial beneficence and people scoring high in instrumental harm. Another factor behind the observed relations is individual differences in general action tendencies. Instrumental harm (in all four studies) as well as impartial beneficence (in three of four studies) showed a negative relation with general preference for inaction over action. Surprisingly, there was no indication that either of the two dimensions of self-reported utilitarianism was positively associated with sensitivity to consequences, although sensitivity to consequences is the hallmark of utilitarianism. If anything, our findings suggest the opposite for impartial beneficence, which showed a significant negative relation to sensitivity to consequences in two of the four studies.

The puzzling aspect of these findings is that the results of the CNI analyses conflict with previous interpretations of findings obtained with the traditional approach. On the one hand, our results replicate previous research showing that both OUS subscales correlate positively with preference for utilitarian over deontological judgments (Kahane et al., 2018). On the other hand, the CNI analyses suggest that higher scores on both OUS subscales are associated with a weaker sensitivity to norms in a deontological sense rather than stronger sensitivity to consequences in a utilitarian sense.¹¹ At this point, we have no basis to decide whether this unexpected result indicates that (a) the OUS lacks construct validity as a measure of utilitarianism or (b) the CNI model does not adequately capture utilitarian responding with its C parameter. Future research is needed to address this question.

BIS/BAS

Previous research found that preference for utilitarian over deontological judgments in traditional dilemma scores was negatively correlated with BIS and positively correlated with BAS (Moore et al., 2011; cf., van den Bos et al., 2011). The current findings suggest that relations between BIS/BAS and moral dilemma judgments may be not particularly reliable. Although Study 2b replicated the negative relation between BIS and preference for utilitarian over deontological judgments, this relation did not replicate in the other three studies. Moreover, BAS was positively related to preference for utilitarian over deontological judgments in two of four studies. The results obtained with CNI model were similarly inconsistent across studies. The only relation that seemed somewhat reliable was a significant negative correlation between BAS and sensitivity to norms, which replicated in three of the four studies. In addition, there was a positive correlation between BIS and sensitivity for norms in two of four studies. Future research may help to clarify whether this association reflects a reliable relation, and if so, how exactly BAS affects sensitivity to norms.

Moral Identity Internalization

Consistent with previous research (Glenn et al., 2010; Reynolds et al., 2019; cf. Conway & Gawronski, 2013), we found a significant negative correlation between moral identity internalization and preference for utilitarian over deontological judgments in all four studies. Analyses with the CNI model suggest that this relation is driven by a greater sensitivity to norms among people with a strong internalized moral identity, as suggested by a significant positive correlation between the two in all four studies. In three of the four studies, we also found a significant positive correlation between moral identity internalization and sensitivity to consequences; two of the four studies additionally found a significant positive correlation with general preference for inaction over action. Although we refrain from drawing conclusions from the latter finding, the obtained relation with sensitivity to consequences suggests that both deontological and utilitarian responses can reflect genuine effects of moral motivations, providing valuable insights for extant debates about which judgments reflect genuinely moral concerns (see Conway et al., 2018; Kahane et al., 2015, 2018).

Religiosity

Different from the findings of earlier studies suggesting that religiosity is associated with a weaker preference for utilitarian over deontological judgments in traditional dilemma scores (e.g., Barak-Corren & Bazerman, 2017; McPhetres et al., 2018; Szekely et al., 2015), we found no evidence for such an association in any of the four studies. In evaluating this discrepancy, it is worth noting that our studies differ from these previous studies in terms of the employed dilemmas and religiosity questionnaire (but see Conway & Gawronski, 2013). Either of these differences as well as statistical fluctuations could account for these findings. However, more fine-grained analyses with the CNI model suggest that religiosity is associated with moral dilemma judgments in a manner that is consistent with the results of previous studies. Across all four studies, religious participants showed a weaker sensitivity to consequences than nonreligious participants. In addition, religiosity showed negative correlations with sensitivity to norms and general preference for inaction over action, but these correlations were significant only in two of the four studies. Thus, although we did not replicate previous findings using the traditional score, the CNI analysis partly accords with previous findings by associating religiosity with reduced sensitivity to consequences (see McPhetres et al., 2018). However, we found no support for the hypothesis that religiosity would be associated with greater norm-sensitivity.

Conclusion

The present work indicates that, with our extended dilemma set, the CNI model is amenable for research on individual differences in moral dilemma judgments. First, the proportions of participants who showed significant deviations between predicted and observed probabilities of *action* versus *inaction* responses was at chance-level. Second, previous findings concerning psychopathy obtained with an extreme-groups approach replicated at the individual level without preselecting extreme groups. Third, demonstrating the more nuanced insights that can be gained from using the CNI model compared with the traditional approach, we obtained systematic relations between three parameters of the CNI model and theoretically relevant individual-difference measures, including psychopathy, empathic concern, need for cognition, self-reported utilitarianism, behavioral activation/inhibition, moral identity internalization, and religiosity. Together, these findings provide a basis for future research with the CNI model using correlational designs, including research on individual differences in moral dilemmas judgments and the prediction of behavior.

To facilitate research along these lines, we have prepared a zip-file that includes our extended dilemma battery, a multiTree template file for individual-difference analyses with the CNI model, and hands-on instructions on how to conduct such analyses. The zip-file with these materials can be downloaded at http://www.bertramgawronski.com/documents/CNI-Model_IndDiffMaterials.zip. It is also available at <https://osf.io/ndf4w/>. We hope that researchers interested in moral dilemma judgment will find these materials useful for their own research, and we look forward to seeing the products of future work using the CNI model in studies with individual-difference designs.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by National Science Foundation (NSF) Grant # 1449620 and Scholarship # 91690494 from the German Academic Exchange Service (DAAD) to Bertram Gawronski as well as by a SCIENTIA postdoctoral scholarship by the Bavarian Gender Equality Grant of the Bavarian State Ministry of Science for Anita Körner. The funders had no role in study design, data collection and analysis, decision to publish or preparation of the manuscript. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the funding agencies.

ORCID iD

Anita Körner  <https://orcid.org/0000-0003-3761-2118>

Notes

1. Whereas the N parameter captures the degree to which participants' responses are sensitive to both proscriptive norms (i.e., norms prohibiting action) and prescriptive norms (i.e., norms prescribing action), the response pattern captured by I parameter subsumes asymmetric effects of proscriptive and prescriptive norms. Such asymmetric effects can occur when violations of proscriptive norms are perceived as more severe than violations of prescriptive norms (see Janoff-Bulman et al., 2009), resulting in a general preference for inaction over action across dilemmas with proscriptive and prescriptive norms.
2. We define replication success in terms of statistical significance in the same direction as the original finding instead of, for example, postulating similar effect sizes.
3. Another common criterion for evaluating the reliability of a given measure is its internal consistency. Because multinomial modeling is based on nonlinear, additive responses (see Hütter & Klauer, 2016), it is not feasible to estimate internal consistencies of the three CNI model parameters using classic test-theoretical procedures.
4. Although we received 200 requests for payment with the correct completion code in Study 1a (see Table 2), data were recorded for only 178 cases. We suspect that either data from the 22 missing cases were lost due to problems with the Inquisit software used to run the study or some participants shared the completion code with others who falsely claimed to have participated in the study. To prevent the latter possibility, we used individual completion codes in the following studies. The problem did not recur.
5. The original ordering of the response options in the BIS/BAS questionnaire ranges from agreement to disagreement. As the other scales we used range from disagreement to agreement, we reversed the ordering of the response options in the BIS/BAS questionnaire.
6. The only difference between Study 1a and 1b is that the items of the OUS were randomized for each participant in Study 1a, whereas Study 1b presented the same items in a fixed random order. The items of the other individual-difference measures were presented in a fixed randomized order in both studies.
7. In response to a request by one of the reviewers, we also calculated process dissociation scores (see Conway & Gawronski, 2013) separately for dilemmas involving proscriptive versus prescriptive norms (see Armstrong et al., 2019). The results of these analyses are presented in the supplemental materials (see supplemental materials Tables S4 and S9 for correlations between process dissociation scores and CNI parameters, and supplemental materials Tables S5 and S10 for correlations between process dissociation scores and individual-difference measures).
8. Because men showed significantly higher psychopathy scores than women (see Cale & Lilienfeld, 2002), we also analyzed partial correlations between psychopathy and the three-model parameters controlling for gender. The partial correlations replicated the overall pattern of zero-order correlations.
9. Following the procedure in Studies 1a and 1b, we also calculated process dissociation scores (see Conway & Gawronski, 2013) separately for dilemmas involving proscriptive versus prescriptive norms (see Armstrong et al., 2019). The results of these analyses are presented in the supplemental materials (see supplemental materials Tables S14 and S19 for correlations between process dissociation scores and CNI parameters, and supplemental materials Tables S15 and S20 for correlations between process dissociation scores and individual-difference measures).

10. Because men showed significantly higher psychopathy scores than women (see Cale & Lilienfeld, 2002), we also analyzed partial correlations between psychopathy and the three-model parameters controlling for gender. The partial correlations replicated the overall pattern of zero-order correlations.
11. A similar conclusion is suggested by analyses using Conway and Gawronski's (2013) process dissociation approach (see supplemental materials, Tables S5, S10, S15, S20).

Supplemental Material

Supplemental material is available online with this article.

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