



# Big Five Personality Traits and Moral-Dilemma Judgments: Two Preregistered Studies using the CNI Model

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## ABSTRACT

A growing line of research suggests that disagreement in moral-dilemma judgments may be rooted in basic personality traits. Using the CNI model, two preregistered studies ( $N = 490$ ) aimed to replicate findings of prior exploratory research on relations between the Big Five and sensitivity to consequences ( $C$ ), sensitivity to moral norms ( $N$ ), and general preference for inaction versus action ( $I$ ) in responses to moral dilemmas. While only one of six previously obtained relations replicated in an undergraduate student sample (Study 1), all six relations replicated in an MTurk worker sample (Study 2). The results highlight the importance of examining the generalizability of relations between basic personality traits and moral judgments in diverse samples for the reproducibility of psychological findings.

## 1. Introduction

Although there are many approaches to understanding the nature of moral judgments (e.g., Graham et al., 2009; Skitka et al., 2005), one major line of research has examined how people resolve moral dilemmas pitting overall consequences for the greater good against adherence to moral norms and duties (e.g., Greene et al., 2001; Greene et al., 2004). In doing so, this body of research has evidenced considerable disagreement between people about the correct course of action in moral dilemmas (e.g., Conway & Gawronski, 2013; Gawronski et al., in press; Helzer et al., 2017). Moreover, this disagreement has been linked to individual differences in a variety of psychological constructs such as antisocial traits (e.g., Bartels & Pizarro, 2011; Marshall et al. 2018) and ideological beliefs (e.g., Bostyn et al., 2016; Hannikainen et al., 2017; Piazza & Sousa, 2014).

Building on this work, a growing line of research has examined the potential role of basic personality traits as a source of disagreement in the resolution of moral dilemmas. Using a formal model called the CNI model of moral decision-making (Gawronski et al., 2017), several recent studies (Kroneisen & Heck, 2020; Luke & Gawronski, 2022) have examined relations between basic personality traits and different factors underlying moral-dilemma judgments. The CNI model is a multinomial model that quantifies sensitivity to consequences (i.e., the extent to which people's responses are influenced by consequences for the greater good;  $C$  parameter), sensitivity to moral norms (i.e., the extent to which

people's responses are influenced by moral norms;  $N$  parameter), and general preference for inaction versus action (i.e., the extent to which people show a general preference for inaction versus action;  $I$  parameter) in responses to moral dilemmas. Research using the CNI model (Kroneisen & Heck, 2020; Luke & Gawronski, 2022) revealed systematic relations between the three factors underlying moral-dilemma judgments and several personality traits from the HEXACO (Ashton & Lee, 2007) and Big Five trait models (John et al., 2008).

While these findings support the idea that disagreement in moral-dilemma judgments may be rooted in basic personality traits, the currently available evidence is limited to a small number of studies. The purpose of the current research was to add to this line of work by replicating prior relations between basic personality traits and different factors underlying moral-dilemma judgments. To this end, the current research assessed basic personality traits according to the Big Five model (John et al., 2008), comprising the personality dimensions of extraversion, agreeableness, conscientiousness, neuroticism, and openness. Following prior research in this area (Kroneisen & Heck, 2020; Luke & Gawronski, 2022), we analyzed moral-dilemma judgments using the CNI model (Gawronski et al., 2017), which enabled the independent quantification of individual differences in sensitivity to consequences, sensitivity to moral norms, and general preference for inaction versus action in responses to moral dilemmas. Across two preregistered studies with samples from an undergraduate student (Study 1) and online worker population (Study 2), we attempted to replicate previously

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obtained relations between the Big Five personality traits and distinct factors underlying moral-dilemma judgments.<sup>1</sup>

### 1.1. Personality and moral dilemma judgments

One prominent approach to understanding moral judgments has been to examine how people decide whether it is acceptable to break a moral norm or rule for the sake of improving collective welfare for the greater good. A classic example of this type of dilemma is the trolley problem (Foot, 1967), a scenario in which a runaway trolley is set on a collision course with five workers. In a version called the *footbridge dilemma* (Thomson, 1976), it is possible to push a large man in front of the trolley, which would obstruct the course of the trolley towards the five workers but kill the man. Judgments that favor pushing the large man have been described as *characteristically utilitarian* because the action would maximize consequences for the greater good (i.e., save the most lives possible; Conway et al., 2018). In contrast, judgments that oppose pushing the large man have been described as *characteristically deontological* because the action would violate salient moral norms and rules (i.e., norms against murder; Conway et al., 2018).

Using scenarios like the footbridge dilemma, past research has made considerable progress in understanding how people resolve conflicts between maximizing outcomes and conforming to relevant moral norms. While one major line of research has examined how the resolution of moral dilemmas depends on situational factors such as social power (Gawronski & Brannon, 2020), experienced stress (Li et al., 2019), and pressure to conform (Bostyn & Roets, 2017a), another line of research has examined how the resolution of moral dilemmas depends on characteristics of the person making the judgment. This latter work has provided evidence for substantial moral disagreement (e.g., Conway & Gawronski, 2013; Gawronski et al., in press; Helzer et al., 2017), which has been related to individual differences in cognition and emotion (e.g., Choe & Min, 2011; Paxton et al., 2012; Royzman et al., 2015), antisocial traits and psychological disorders (e.g., Bartels & Pizarro, 2011; Marshall et al., 2018; Patil et al., 2021), and ideological beliefs (e.g., Bostyn et al., 2016; Hannikainen et al., 2017; Piazza & Sousa, 2014). Collectively, this line of work has shed further light on the nature of moral-dilemma judgments by examining how disagreements between people may be rooted in individual differences in central psychological constructs.

While this research has considered a range of potential sources of disagreement in moral-dilemma judgments, basic personality traits have received comparatively less attention. Personality traits such as those found in the Big Five model (John et al., 2008) or the HEXACO model (Ashton et al., 2014) have been related to instances of morally relevant behavior (for a review, see Smillie et al., 2019) and other aspects of moral judgment (e.g., Alper & Yilmaz, 2019; Hirsh et al., 2010; Lewis & Bates, 2011). Yet, only a small number of studies have investigated relations between basic personality traits and responses to moral dilemmas. The findings of these studies suggest that honesty-humility from the HEXACO model is negatively associated with preference for utilitarian over deontological judgments (Djeriouat & Trémolière, 2014), while neuroticism from the Big Five model is positively associated with preference for utilitarian over deontological judgments (Robinson et al., 2015).

Although the results of these studies lend preliminary support to the idea that disagreement in moral-dilemma judgments may be rooted in basic personality traits, they suffer from a major methodological limitation. As has been common in much of prior research (e.g., Greene et al., 2001; Greene et al., 2004), these studies measured moral judgments using dilemmas similar in structure to the trolley problem, which

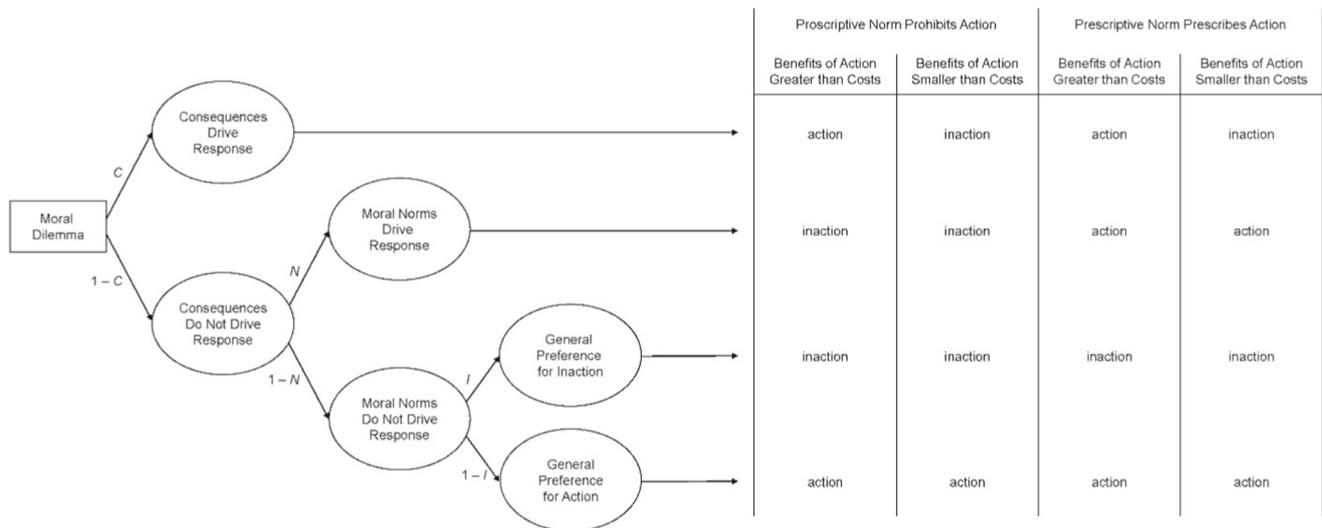
involve two notable confounds. First, traditional moral dilemmas pit maximization of outcomes against adherence to moral norms, with endorsement of one necessarily implying rejection of the other. Given that the processes underlying the two kinds of judgments are presumed to operate independently (Conway & Gawronski, 2013), it is unclear whether disagreement in the resolution of moral dilemmas reflects differences in outcome maximization, differences in norm adherence, or differences in both. Second, outcome maximization usually entails endorsing action in traditional moral dilemmas (e.g., pushing the large man), whereas norm adherence usually entails endorsing inaction (e.g., not pushing the large man). Hence, disagreement in the resolution of these dilemmas could further reflect differences in general preferences for action or inaction, independent of outcome maximization or norm adherence (Crone & Laham, 2017). Together, these considerations suggest that disagreements about the right course of action in traditional moral dilemmas could reflect individual differences in (1) maximization of outcomes for the greater good, (2) adherence to moral norms, or (3) general preference for action versus inaction. As a way of addressing these issues, the CNI model of moral decision-making was developed to separately quantify the three distinct factors underlying moral-dilemma judgments (Gawronski et al., 2017), thereby allowing for more nuanced insights into the roots of moral disagreements.

### 1.2. CNI model

The CNI model is a multinomial model that analyzes responses to four types of moral dilemmas varying in terms of their consequences and moral norms in order to independently quantify (1) sensitivity to consequences, (2) sensitivity to moral norms, and (3) general preference for inaction versus action. Sensitivity to consequences is captured by the model's *C* parameter, which reflects the tendency to judge actions as acceptable (*action response*) when their benefits outweigh their costs and unacceptable (*inaction response*) when their costs outweigh their benefits (see first row in Fig. 1). Sensitivity to moral norms is captured by the model's *N* parameter, which reflects the tendency to judge actions as acceptable (*action response*) when they are prescribed by a moral norm and unacceptable (*inaction response*) when they are prohibited by a moral norm (see second row in Fig. 1). General preference for inaction versus action is captured by the *I* parameter, which reflects the tendency to judge actions as generally unacceptable (*inaction response*) versus generally acceptable (*action response*) regardless of the consequences and moral norms involved (see third and fourth row in Fig. 1).

Using the CNI model, two recent studies have examined how basic personality traits are related to the three distinct factors underlying moral-dilemma judgments. In one study, Kroneisen and Heck (2020) examined relations between a selected subset of basic personality traits from the HEXACO model (Ashton & Lee, 2007) and CNI model parameters estimated using an abridged set of moral dilemmas from a battery developed for research using the CNI model (Gawronski et al., 2017). Results of an integrative data analysis revealed (1) a positive association between emotionality and sensitivity to consequences, (2) a positive association between honesty-humility and sensitivity to moral norms, and (3) a positive association between emotionality and general preference for inaction versus action (Kroneisen & Heck, 2020). In another study, Luke and Gawronski (2022) examined relations between the full set of basic personality traits from the Big Five model (John et al., 2008) and CNI model parameters estimated using an extended dilemma battery for research using the CNI model (Körner et al., 2020). Across two time points one month apart, exploratory correlational and multiple regression analyses revealed a negative association between extraversion and the *C* parameter, a positive association between agreeableness and the *N* parameter, and a positive association between openness and all three CNI parameters (Luke & Gawronski, 2022). Taken together, these results suggest that those higher in extraversion are less sensitive to consequences than those lower in extraversion, those higher in agreeableness are more sensitive to moral norms than those lower in

<sup>1</sup> Both studies reported here were formally preregistered. The preregistration for Study 1 can be found at <https://osf.io/vgwue> and the preregistration for Study 2 can be found at <https://osf.io/pu2wd>.



**Fig. 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. Reproduced from [Gawronski et al. \(2017\)](#). Reprinted with permission from the American Psychological Association.

agreeableness, and those higher in openness are more sensitive to consequences, more sensitive to moral norms, and show a stronger general preference for inaction versus action than those lower in openness. Collectively, these studies provide further support for the idea that disagreements in moral-dilemma judgments are rooted in basic personality traits, and further link specific personality traits to particular determinants of moral-dilemma judgments.

### 1.3. The current research

While these findings suggest systematic relations between basic personality traits and specific determinants of moral-dilemma judgments, this line of research has been limited to a small number of studies. Moreover, prior findings by [Luke and Gawronski](#) were the product of exploratory analyses conducted using data from a single sample at two separate time points. Consequently, further research is needed to investigate the replicability of relations between basic personality traits and factors underlying moral-dilemma judgments. The purpose of the current research was to replicate and build on this prior work by examining relations between the Big Five personality traits and the distinct factors underlying moral-dilemma judgments. To this end, we measured basic personality traits using the Big Five Inventory 2 – Short Form (BFI-2-S; [Soto & John, 2017a](#)), which captures individual differences in extraversion, agreeableness, conscientiousness, neuroticism, and openness. Moral-dilemma judgments were measured using a well-validated battery of moral dilemmas manipulating consequences and moral norms ([Körner et al., 2020](#)). Moral-dilemma judgments were analyzed using the CNI model to capture individual differences in sensitivity to consequences, sensitivity to moral norms, and general preference for inaction versus action ([Gawronski et al., 2017](#)). For the sake of generality and replicability, we conducted two studies: one with an undergraduate student sample (Study 1) and one with an online-worker sample (Study 2).

The hypotheses for the current research were derived based on a reanalysis of existing data from [Luke and Gawronski \(2022\)](#). Using the CNI model, the purpose of this prior research was to examine the temporal stability of moral-dilemma judgments as well as the relations between the Big Five personality traits and moral-dilemma judgments. To this end, [Luke and Gawronski](#) conducted a single longitudinal study comprised of two time points, one month apart. The procedure across time points was identical. At each time point, participants recruited on Amazon’s Mechanical Turk (MTurk) were first asked to complete (1) a

basic arithmetic equation to prevent the participation of bots, (2) the BFI-2-S ([Soto & John, 2017a](#)) as an assessment of the Big Five personality traits ([John et al., 2008](#)), (3) a battery of moral dilemmas developed and validated for research using the CNI model ([Gawronski et al., 2017](#); [Körner et al., 2020](#)), (4) a set of demographic questions, and (5) a reading-intensive attention check. Participants who failed the arithmetic equation were not allowed to participate, and participants who failed the attention check or provided duplicate submissions were excluded from analyses. Only participants who completed both time points were retained for analyses, resulting in a final sample of 195 participants across time points (49.23% female, 49.74% male, 1.03% prefer not to answer;  $M_{age} = 34.42$ ,  $SD_{age} = 10.91$ ). Moral dilemma-judgments were quantified using the CNI model ([Gawronski et al., 2017](#)), resulting in unique parameter estimates for each participant reflecting their sensitivity to consequences, sensitivity to moral norms, and general preference for inaction versus action.

For the purpose of investigating relations between the Big Five personality traits and the three factors underlying moral-dilemma judgments, [Luke and Gawronski \(2022\)](#) conducted (1) correlational analyses between Big Five trait scores and CNI parameter estimates to examine zero-order relations, and (2) multiple regression analyses regressing each parameter (i.e., *C* parameter, *N* parameter, *I* parameter) onto Big Five trait scores to examine unique relations between the Big Five personality traits and moral-dilemma judgment. Only relations that replicated in both the correlational and multiple regression analyses across both time points were interpreted by the authors. As summarized previously, findings from this work suggested (1) a reliable negative relation between extraversion and sensitivity to consequences, (2) a reliable positive relation between agreeableness and sensitivity to moral norms, and (3) reliable positive relations between openness and all three factors underlying moral-dilemma judgments.

Our reanalysis of this existing data set differed from the exploratory analyses reported by [Luke and Gawronski](#) in two ways. First, given our focus on zero-order correlations, our hypotheses were based exclusively on the results of correlational analyses. This approach differed from the one adopted by [Luke and Gawronski](#), who limited their conclusions to associations that replicated across correlation and multiple regression analyses. Second, our hypotheses were based on analyses using the full sample (after data quality exclusions) at each time point of [Luke and](#)

Gawronski's longitudinal data ( $n_1 = 304$ ;  $n_2 = 195$ ). This approach differed from the one adopted by Luke and Gawronski, who restricted their data base to participants who completed both assessments ( $n = 195$ ).<sup>2</sup> Taken together, we conducted correlational analyses between the Big Five trait scores and CNI parameters using the existing data from Luke and Gawronski at Time 1 ( $n = 304$ ) and at Time 2 ( $n = 195$ ). Only correlations that replicated across time points (at least at a marginal level) were used to derive hypotheses for the current research.

As seen in Table 1, the reanalysis revealed six relations between the Big Five personality traits and CNI parameters that replicated across time points: a negative correlation between extraversion and the C parameter, a positive correlation between agreeableness and the N parameter, a positive correlation between conscientiousness and the N parameter, and positive correlations between openness and all three parameters. Based on these results, we derived six hypotheses regarding correlations between Big Five personality traits and CNI parameters. For extraversion, we expected a negative correlation with the C parameter such that higher levels of extraversion are associated with weaker sensitivity to consequences (Hypothesis 1). For agreeableness, we expected a positive correlation with the N parameter such that higher levels of agreeableness are associated with stronger sensitivity to moral norms (Hypothesis 2). For conscientiousness, we expected a positive correlation with the N parameter such that higher levels of conscientiousness are associated with stronger sensitivity to moral norms (Hypothesis 3). Lastly, for openness, we expected a positive correlation with all three parameters such that higher levels of openness are associated with stronger sensitivity to consequences (Hypothesis 4a), stronger sensitivity to moral norms (Hypothesis 4b), and stronger general preference for inaction versus action (Hypotheses 4c).

While these hypotheses were derived from an empirical reanalysis of existing data, there are theoretical reasons in favor of each hypothesis. With respect to the negative relation between extraversion and sensitivity to consequences, past research suggests that extraversion entails an increased sensitivity to social rewards (i.e., social attention; Ashton et al., 2002). Given that preferences for deontological over utilitarian judgment garner more favorable perceptions from others (e.g., Bostyn & Roets, 2017b; Everett et al., 2016; Sacco et al., 2017; see also Gawronski, 2022), it might be expected that higher levels of extraversion lead to reduced sensitivity to consequences due to a greater concern about negative evaluations from others (Luke & Gawronski, 2022).

With respect to the positive relation between agreeableness and sensitivity to moral norms, agreeableness has been conceptually linked to empathic concern for others (Wilmot & Ones, 2022) and reliance on social norms (e.g., DeYoung et al., 2007). To the extent that sensitivity to moral norms is driven by empathic concern (Conway & Gawronski, 2013; Körner et al., 2020) or rule-based decision-making (Holyoak & Powell, 2016; Nichols & Mallon, 2006), it might be expected that higher levels of agreeableness lead to increased sensitivity to moral norms due to greater empathic concern and greater reliance on rules (Luke & Gawronski, 2022; Smillie et al., 2021).

A similar argument can be made for the positive relation between conscientiousness and sensitivity to moral norms, given that conscientiousness has been linked to a tendency to follow rules (Jackson & Roberts, 2017). As in the case of agreeableness, to the extent that rule-based decision-making drives adherence to moral norms in responses to moral dilemmas (Holyoak & Powell, 2016; Nichols & Mallon, 2006), it might be expected that higher levels of conscientiousness lead to increased sensitivity to moral norms due to a stronger reliance on rule-based decision-making.

With respect to the positive relations between openness and all three

<sup>2</sup> When formulating our hypotheses, we incorrectly omitted one participant in our analyses at Time 1 ( $n = 304$ ) due to a data recording error. However, reconducting analyses with this participant included ( $n = 305$ ) did not change the results on which our hypotheses are based.

factors underlying moral-dilemma judgments, openness has been conceptually linked to complex cognitive functioning (DeYoung, 2015). Applied to the moral domain, openness may be expressed in the tendency to reflect more strongly on moral issues generally (e.g., Reynolds, 2008; Vanaman et al., 2019), resulting in more systematic patterns of moral judgment across dilemmas (Luke & Gawronski, 2022). Specifically, moral reflection may promote a systematic tendency to judge actions according to their consequences and their adherence to moral norms, leading to greater sensitivity to both consequences and moral norms among those who are more open. Additionally, given that a pattern of general inaction in moral dilemmas can reflect the systematic tendency to judge harm caused through action to be worse than harm caused through inaction (i.e., *omission bias*; Cushman et al., 2006), greater moral reflection may similarly drive a stronger preference for inaction versus action among those who are more open.

To test these hypotheses, we conducted an a priori power analysis using GPower 3.1 (Faul et al., 2009) to determine the minimum sample size necessary to detect a Pearson correlation of  $r = 0.18$  with 80% power using a two-tailed test ( $\alpha = 0.05$ ). The effect size of  $r = 0.18$  was chosen because this was the smallest significant effect size reliably obtained in our reanalysis of existing data (see Table 1). The power analysis revealed a required sample size of 239 participants. To cover this minimum sample size, we aimed to recruit 250 participants in Study 1.<sup>3</sup> Because Study 2 included an attention check and because we anticipated a ~ 10% attention-check failure rate, we aimed to recruit 275 participants in Study 2. Both studies were formally preregistered before data collection. The preregistration for Study 1 can be accessed at <https://osf.io/vgwue> and the preregistration for Study 2 can be accessed at <https://osf.io/pu2wd>. All data, syntax, and materials can be accessed at <https://osf.io/382yh/>. Both studies received proper institutional ethical approval and informed consent was received from all participants.

## 2. Study 1

### 2.1. Methods

**Participants.** All participants were recruited from a pool of undergraduate students taking an introductory psychology class at the University of Texas at Austin in the fall of 2019. Students who chose to take part in this study were asked to report to a psychological laboratory to participate in a one-hour study battery that included the current study and an unrelated study on a different topic. The final sample was comprised of 250 participants (72.00% female, 26.40% male, 0.80% prefer not to answer, 0.80% other;  $M_{age} = 18.72$ ,  $SD_{age} = 1.58$ ).<sup>4</sup> In terms of ethnicity, 30.00% of the sample identified as Spanish, Hispanic, or Latino. In terms of racial identification, 58.40% of the sample identified as Caucasian, 7.60% as Black or African American, 2.80% as American Indian or Alaskan Native, 36.00% as Asian, 0.40% as Native Hawaiian or Pacific Islander, and 2.80% as other. Participants received research credit in their introductory psychology course for their participation.

**Procedure and Materials.** After providing informed consent, participants were seated in an individual testing room and asked to take an

<sup>3</sup> Due to excessive sign-ups toward the end of the study, the data set of Study 1 included five additional participants, resulting in a collected sample of 255 participants. In line with our preregistered analytic plan, we only report analyses using data from the first 250 participants. For the sake of robustness, we also conducted analyses using the full sample of 255 participants. Results relating to our hypothesized relations were unchanged in terms of significance and therefore do not qualify any of our conclusions (see Table S1 in the Supplemental Online Materials).

<sup>4</sup> Data from one participant who reported being 13 years old were not included in the descriptive statistics of age data, because the reported age most likely reflects a data entry error.

**Table 1**

Cross-sectional zero-order correlations between personality traits and moral judgment indices in existing data from Luke and Gawronski (2022).

Personality Trait	Time 1 (n = 304)				Time 2 (n = 195)			
	Traditional	C Parameter	N Parameter	I Parameter	Traditional	C Parameter	N Parameter	I Parameter
Extraversion	-0.07	-0.20***	-0.04	-0.03	-0.07	-0.18*	-0.08	-0.04
Agreeableness	-0.30***	0.10 <sup>†</sup>	0.40***	0.16**	-0.24***	0.02	0.23**	0.09
Conscientiousness	-0.20***	-0.01	0.18**	0.08	-0.24***	-0.05	0.15*	0.05
Neuroticism	0.03	-0.03	-0.04	0.01	0.08	-0.01	-0.02	0.05
Openness	-0.26***	0.23***	0.41***	0.22***	-0.22**	0.14 <sup>†</sup>	0.27***	0.14*

Note: Traditional = traditional dilemma score. <sup>†</sup>  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

assessment on a computer, which was presented using MediaLab software. Participants were first asked to complete the BFI-2-S (Soto & John, 2017a), a 30-item personality instrument assessing extraversion, agreeableness, conscientiousness, neuroticism, and openness. Each trait was measured using a six-item subscale and each item was answered using 5-point rating scales ranging from 1 (*disagree strongly*) to 5 (*agree strongly*). Following completion of the BFI-2-S, participants were then asked to respond to a battery of moral dilemmas (presented in a fixed random order), which was developed in prior work (Körner et al., 2020) and has been well-validated for use with the CNI model (Gawronski et al., 2020).<sup>5</sup> The moral-dilemma battery consists of 48 moral dilemmas total, which can be broken down into 12 basic scenarios with four variations on each manipulating whether the described action (1) produces greater or smaller benefits than costs and (2) is prohibited or prescribed by a moral norm (for an example scenario, see Table 2). For each dilemma, participants were asked to judge whether the action described is acceptable using a dichotomous *yes vs no* response scale. Finally, after completing the moral-dilemma battery, participants were asked to complete a set of demographic questions assessing gender, age, ethnic and racial identification, education, and political ideology.

**Analytic Plan.** Following prior work using the CNI model (e.g., Gawronski et al., 2017; Körner et al., 2020), moral-dilemma judgments were analyzed using two different approaches. In keeping with the traditional approach to moral-dilemma judgments (e.g., Greene et al., 2001; Greene et al., 2004), we first analyzed judgments as preference for breaking proscriptive norms to maximize overall consequences (structurally equivalent to responses in the trolley problem). To this end, we summed the number of times participants judged actions as acceptable in dilemmas in which the described action was prohibited by a moral norm but produced greater benefits than costs. We refer to this summed score as the *traditional dilemma score*, which can range from 0 to 12. To examine the association between the Big Five personality traits and relative preference for utilitarian over deontological judgment on traditional dilemmas, we conducted a set of exploratory correlational analyses between Big Five trait scores and traditional dilemma scores.

To provide more nuanced insights, moral-dilemma judgments were further analyzed using the CNI model (Gawronski et al., 2017) to quantify sensitivity to consequences, sensitivity to moral norms, and general preference for inaction versus action in responses to moral dilemmas. The CNI model can be depicted as a multinomial processing tree, as shown in Fig. 1. The CNI model analyzes responses to four types of moral dilemmas that vary in terms of their consequences and moral norms (represented by the right-hand columns). Each dilemma describes an action for which participants are asked to judge whether the action is acceptable (*action response*) or unacceptable (*inaction response*).

<sup>5</sup> It is worth noting that Gawronski and colleagues (2020) found that the manipulation of moral norms did not significantly influence moral-dilemma judgments for one of the 12 basic scenarios contained in the moral dilemma battery developed by Körner and colleagues (2020). For the sake of robustness, we reconducted correlational analyses in Studies 1 and 2 excluding responses to this scenario (see Tables S2-3 in the Supplemental Online Materials). Overall, results pertaining to our hypothesized relations were unchanged in terms of significance across analyses, supporting the robustness of our findings.

**Table 2**

Example scenario broken down into four variants reflecting the independent manipulations of consequences and moral norms.

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
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. Is it acceptable in this case to give the student the medication?	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. Is it acceptable in this case to give the student the medication?	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. Is it acceptable in this case to take the student out of quarantine to return her to her home country for treatment?	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. Is it acceptable in this case to take the student out of quarantine to return her to her home country for treatment?

Consequences are manipulated across moral dilemmas such that the benefits of the described action outweigh the costs in two of the four types of moral dilemmas (columns 1 and 3) and the costs outweigh the benefits in the other two types of moral dilemmas (columns 2 and 4). Orthogonal to the manipulation of consequences, moral norms are manipulated across moral dilemmas such that the described action is proscribed by a moral norm in two of the four types of moral dilemmas (columns 3 and 4) and prohibited by a moral norm in the other two types of moral dilemmas (columns 1 and 2).

Each factor in the CNI model is captured by a distinct processing path (represented by left-hand branches in Fig. 1), which capture a unique pattern of responding across the four dilemma types. The CNI model's C parameter captures a pattern of responding in which actions are judged

acceptable when their benefits outweigh their costs (*action response*) and unacceptable when their costs outweigh their benefits (*inaction response*). Thus, higher scores on the *C* parameter reflect a greater sensitivity to consequences. The CNI model's *N* parameter captures a pattern of responding in which actions are judged acceptable when they are prescribed by a moral norm (*action response*) and unacceptable when they are prohibited by a moral norm (*inaction response*). Thus, higher scores on the *N* parameter reflect a greater sensitivity to moral norms. The CNI model's *I* parameter captures a pattern of responding in which actions are generally judged as unacceptable (*inaction response*) rather than acceptable (*action response*) regardless of consequences and moral norms. Higher scores on the *I* parameter reflect a greater general preference for inaction, while lower scores reflect a greater general preference for action.

Based on these processing paths and their associated responses, it is possible to express the probability of obtaining an action response and the probability of obtaining an inaction response for each of the four moral dilemma types in terms of the CNI parameters. Consider the probability of obtaining an action response in dilemmas in which the described action is prohibited by a moral norm but produces greater benefits than costs,  $p(\text{action} \mid \text{proscriptive norm, benefits} > \text{costs})$ . For this type of dilemma (first column), an action response occurs when either consequences drive the response, *C*, or when neither consequences, moral norms, nor general preference for inaction versus action drive the response,  $[(1 - C) \times (1 - N) \times (1 - I)]$ . Thus, the probability of obtaining an action response for this type of dilemma can be expressed as  $p(\text{action} \mid \text{proscriptive norm, benefits} > \text{costs}) = C + [(1 - C) \times (1 - N) \times (1 - I)]$ . Using this method, it is possible to express the probability of action and inaction responses for the four moral dilemma types in terms of model parameters, resulting in eight equations total (see Appendix).<sup>6</sup> Expanding on these equations, the CNI model uses maximum likelihood statistics to estimate numeric values for the model parameters by minimizing the discrepancy between the predicted and observed probability of action versus inaction responses across moral dilemma types. Resulting parameter estimates can range from 0 to 1. Higher values on the *C* parameter reflect a stronger sensitivity to consequences. Higher values on the *N* parameter reflect a stronger sensitivity to moral norms. Values exceeding 0.50 reflect a stronger general preference for inaction, whereas values below 0.50 reflect a stronger general preference for action.

Following the procedure of Körner and colleagues (2020), we analyzed moral-dilemma judgments using the CNI model at the individual-level to obtain unique parameter estimates for each participant. To this end, we first aggregated the number of times each participant judged actions as acceptable (i.e., action response) and unacceptable (i.e., inaction response) for each of the four types of moral dilemmas. This aggregation procedure yielded action and inaction indices for each of the four dilemma types, resulting in 8 aggregated indices total. For each participant, we fit the CNI model to their 8 aggregated indices using the freeware MultiTree (Moshagen, 2010). Following the procedure recommended by Gawronski et al. (2017), the modeling analyses used a fixed estimation algorithm with random start values, two replications, and a maximum of 90,000 iterations.

To examine the hypothesized associations between the Big Five personality traits and the factors underlying moral-dilemma judgments, we conducted a set of confirmatory correlational analyses testing the six

<sup>6</sup> Given that  $p(\text{action}) = 1 - p(\text{inaction})$ , four of these eight equations are redundant, one for each type of moral dilemma.

hypothesized relations between Big Five trait scores and CNI parameters. In a further set of exploratory correlational analyses, we examined all other potential associations between the Big Five personality traits and the factors underlying moral-dilemma judgments.<sup>7</sup>

## 2.2. Results

Means and 95% confidence intervals of aggregated moral-judgment data across studies are presented in Table 3. Means, standard deviations, 95% confidence intervals, and internal consistencies of the Big Five trait scores and the CNI parameters across studies are presented in Table 4. Correlation coefficients between Big Five trait scores and CNI parameters across studies are presented in Table 5.

**Traditional Scores.** Traditional dilemma scores did not show significant associations with any Big Five trait scores, although the association with agreeableness was marginal,  $r(248) = -0.12, p = .051$ . Taken together, these results suggest no relation between the Big Five personality traits and preference for breaking proscriptive norms to maximize overall consequences.

**C Parameter.** In contrast to Hypotheses 1 and 4a, the *C* parameter did not show a significant association with either extraversion scores,  $r(248) = -0.02, p = .799$ , or openness scores,  $r(248) = 0.04, p = .571$ . The *C* parameter was also not significantly associated with any other Big Five trait scores ( $ps > 0.314$ ). Taken together, these results suggest no relation between the Big Five personality traits and sensitivity to consequences.

**N Parameter.** In support of Hypothesis 2, the *N* parameter showed a significant positive association with agreeableness scores,  $r(248) = 0.19, p = .003$ . In contrast to Hypotheses 3 and 4b, the *N* parameter did not show a significant association with either conscientiousness scores,  $r(248) = 0.09, p = .171$ , or openness scores,  $r(248) = -0.04, p = .482$ . The *N* parameter was not significantly associated with any other Big Five trait scores ( $ps > 0.387$ ). Taken together, these results suggest that higher levels of agreeableness are associated with stronger sensitivity to moral norms.

**I Parameter.** In contrast to Hypothesis 4c, the *I* parameter did not show a significant association with openness scores,  $r(248) = 0.01, p = .883$ . The *I* parameter was also not significantly associated with any other Big Five trait scores ( $ps > 0.168$ ). Taken together, these results suggest no relation between the Big Five personality traits and general preference for inaction versus action.

## 2.3. Discussion

The purpose of Study 1 was to replicate and build on prior work by examining correlations between the Big Five personality traits and the distinct factors underlying moral-dilemma judgments in a sample of undergraduate students. In support of Hypothesis 2, the *N* parameter showed the expected positive relation with agreeableness, suggesting that those who are more agreeable are more sensitive to moral norms than those who are less agreeable. However, none of the other five hypotheses were supported by the results of Study 1. Specifically, the *C* parameter was not significantly associated with extraversion, the *N* parameter was not significantly associated with conscientiousness, and none of the CNI parameters were significantly associated with openness.

Given the conflicting outcomes of Study 1 and prior research by Luke and Gawronski (2022), we conducted an additional replication attempt in Study 2, which was designed to more closely match the sample and

<sup>7</sup> To test the robustness of our results, we conducted further exploratory analyses in which we bootstrapped Pearson and Spearman rank correlation coefficients across 10,000 bootstrapped samples (see Tables S4-S7 in the Supplemental Online Materials). Overall, results pertaining to our hypothesized relations were unchanged in terms of significance across analyses, supporting the robustness of our findings.

**Table 3**

Means 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. The neutral reference value of equal numbers of action and inaction responses is 6.

	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 1	4.78	[4.49, 5.08]	1.72	[1.54, 1.91]	9.94	[9.74, 10.15]	6.69	[6.40, 6.98]
Study 2	6.05	[5.63, 6.46]	4.56	[4.07, 5.05]	9.23	[8.92, 9.53]	7.90	[7.58, 8.22]

**Table 4**

Means, 95% confidence intervals, and estimates of internal consistency of CNI model parameters and personality trait scores.

Variable	Study 1			Study 2		
	M (SD)	95% CI	α	M (SD)	95% CI	α
C Parameter	0.26 (0.17)	[0.24, 0.29]	0.61	0.13 (0.15)	[0.12, 0.15]	0.47
N Parameter	0.58 (0.28)	[0.54, 0.61]	0.51	0.37 (0.36)	[0.32, 0.41]	0.85
I Parameter	0.56 (0.29)	[0.52, 0.59]	0.25	0.46 (0.30)	[0.43, 0.50]	0.66
Extraversion	3.27 (0.74)	[3.17, 3.36]	0.78	3.06 (0.69)	[2.97, 3.15]	0.68
Agreeableness	3.69 (0.64)	[3.61, 3.77]	0.75	3.61 (0.68)	[3.53, 3.70]	0.72
Conscientiousness	3.49 (0.68)	[3.40, 3.57]	0.79	3.58 (0.69)	[3.49, 3.67]	0.74
Neuroticism	3.02 (0.87)	[2.92, 3.13]	0.86	2.61 (0.74)	[2.51, 2.70]	0.74
Openness	3.56 (0.59)	[3.48, 3.63]	0.65	3.49 (0.69)	[3.41, 3.58]	0.70

Note: Estimates of internal consistency for CNI parameters were calculated using two unique sets of CNI parameter estimates, one set estimated using odd-numbered moral dilemmas and one set estimated using even-numbered moral dilemmas.

**Table 5**

Cross-sectional zero-order correlations between personality traits and moral judgment indices in Study 1 and Study 2.

Personality Trait	Study 1 (n = 250)				Study 2 (n = 240)			
	Traditional	C Parameter	N Parameter	I Parameter	Traditional	C Parameter	N Parameter	I Parameter
Extraversion	-0.04	-0.02	0.01	-0.01	-0.07	-0.22***	-0.04	0.13*
Agreeableness	-0.12 <sup>†</sup>	-0.04	0.19**	-0.09	-0.39***	0.20**	0.40***	0.29***
Conscientiousness	-0.07	-0.06	0.09	-0.03	-0.33***	0.12 <sup>†</sup>	0.31***	0.31***
Neuroticism	0.00	-0.02	-0.05	0.07	0.18**	0.02	-0.11 <sup>†</sup>	-0.21**
Openness	0.04	0.04	-0.04	0.01	-0.27***	0.26***	0.31***	0.22***

Note: Traditional = traditional dilemma score. <sup>†</sup> p < .10. \* p < .05. \*\* p < .01. \*\*\* p < .001.

methodology of Luke and Gawronski. As in Study 1, basic personality traits were measured using the BFI-2-S (Soto & John, 2017a), and moral-dilemma judgments were analyzed using the CNI model (Gawronski et al., 2017). However, in contrast to Study 1, we examined the relation between basic personality traits and factors underlying moral-dilemma judgments in an online worker sample recruited from MTurk. In addition, we introduced several data quality measures to prevent the participation of bots and exclude inattentive participants in data analyses. Taken together, Study 2 served as a more direct replication of the approach adopted by Luke and Gawronski (2022).

### 3. Study 2

#### 3.1. Methods

**Participants.** All participants were recruited through Amazon’s MTurk in December 2019. To be eligible to participate, MTurk workers were required to (1) be 18 years old or older, (2) have an approval rating of over 95% on MTurk, (3) live in the United States, (4) have completed at least 1 prior assignment on MTurk, and (5) have not participated in a prior study from the authors’ lab using the moral dilemmas involved in the current research. Participants were required to solve a simple arithmetic equation (e.g., “6 + 7”) before participating in the study and were presented with an attention check question at the end of the study (see below). Participants who incorrectly answered two arithmetic equations were not allowed to participate and participants who failed

the attention check question were excluded from analyses. Of the 280 participants who completed the assessment,<sup>8</sup> 40 participants failed the attention check, leaving a final sample of 240 participants (39.17% female, 60.00% male, 0.83% prefer not to answer; M<sub>age</sub> = 34.37, SD<sub>age</sub> = 10.21). In terms of ethnicity, 18.75% of the sample identified as Spanish, Hispanic, or Latino. In terms of racial identification, 82.92% identified as Caucasian, 12.50% as Black or African American, 1.25% as American Indian or Alaskan Native, 4.58% as Asian, and 0.42% as other. Participants received \$4.00 for their participation.

**Procedure and Materials.** The procedure and materials for Study 2 were identical to Study 1 with two exceptions, both of which were included to more directly reproduce the details of Luke and Gawronski’s (2022) study. First, participants were asked to solve a simple arithmetic equation at the beginning of the study as a way of preventing the participation of bots. If participants incorrectly answered two simple arithmetic equations, then participants were not allowed to participate in the study. Second, participants were presented with a reading-intensive attention check question at the end of study. The attention check presented participants with a set of instructions directing them not to answer a question (see below).

<sup>8</sup> Five participants completed the study but either did not submit a completion code for compensation or submitted an incorrect completion code.

Many variables can greatly impact decision-making. In order to facilitate our research on decision-making we are interested in knowing certain factors about you, the decision maker. Specifically, we are interested in whether you actually take the time to read the directions; if not, then some of our manipulations that rely on changes in the instructions will be ineffective. So, in order to demonstrate that you have read the instructions, please ignore the sports items below. Instead, simply continue on to the next page after the options. Thank you very much. Which of these activities do you engage in regularly? (check all that apply)

Answer choices to the attention check question were: *Football, Soccer, Dancing, Watersports, Triathlon, Running, Volleyball, and I don't play sports*. Participants pass the attention check by not answering the question (i.e., not selecting any answer choices) and proceeding to the next question. If participants answered the question by selecting any of the answer choices, then participants failed to correctly follow instructions and were excluded from analyses.

**Analytic Plan.** The analytic plan for Study 2 was identical to the analytic plan for Study 1.

### 3.2. Results

**Traditional Scores.** Traditional dilemma scores showed a significant positive association with neuroticism scores,  $r(238) = 0.18, p = .005$ , and significant negative associations with agreeableness scores,  $r(238) = -0.39, p < .001$ , conscientiousness scores,  $r(238) = -0.33, p < .001$ , and openness scores,  $r(238) = -0.27, p < .001$ . Traditional dilemma scores were not significantly associated with extraversion scores,  $r(238) = -0.07, p = .278$ . Taken together, these results suggest that higher levels of neuroticism and lower levels of agreeableness, conscientiousness, and openness are associated with stronger preference for breaking proscriptive norms to maximize overall consequences.

**C Parameter.** In support of Hypotheses 1 and 4a, the C parameter showed a significant negative association with extraversion scores,  $r(238) = -0.22, p < .001$ , and a significant positive association with openness scores,  $r(238) = 0.26, p < .001$ . The C parameter also showed a significant positive association with agreeableness scores,  $r(238) = 0.20, p = .002$ . The C parameter was not significantly associated with any other Big Five trait scores, although the association with conscientiousness scores was marginal,  $r(238) = 0.12, p = .072$ . Taken together, these results suggest that higher levels of agreeableness and openness and lower levels of extraversion are associated with stronger sensitivity to consequences.

**N Parameter.** In support of Hypotheses 2, 3, and 4b, the N parameter showed a significant positive association with agreeableness scores,  $r(238) = 0.40, p < .001$ , conscientiousness scores,  $r(238) = 0.31, p < .001$ , and openness scores,  $r(238) = 0.31, p < .001$ . The N parameter was not significantly associated with any other Big Five trait scores, although the association with neuroticism scores was marginal,  $r(238) = -0.11, p = .081$ . Taken together, these results suggest that higher levels of agreeableness, conscientiousness, and openness are associated with stronger sensitivity to moral norms.

**I Parameter.** In support of Hypothesis 4c, the I parameter showed a significant positive association with openness scores,  $r(238) = 0.22, p < .001$ . The I parameter also showed significant positive associations with extraversion scores,  $r(238) = 0.13, p = .049$ , agreeableness scores,  $r(238) = 0.29, p < .001$ , and conscientiousness scores,  $r(238) = 0.31, p < .001$ , as well as a significant negative association with neuroticism scores,  $r(238) = -0.21, p = .001$ . Taken together, these results suggest that higher levels of extraversion, agreeableness, conscientiousness, and openness and lower levels of neuroticism are associated with stronger preference for inaction versus action.

### 3.3. Discussion

In contrast to Study 1, results of Study 2 confirmed all six

preregistered hypotheses. In support of Hypothesis 1, the C parameter showed the expected negative relation with extraversion, suggesting that those who are more extraverted are less sensitive to consequences than others. In support of Hypotheses 2 and 3, the N parameter showed the expected positive relations with agreeableness and conscientiousness, suggesting that those who are more agreeable and conscientious are more sensitive to moral norms than others. In support of Hypotheses 4a-c, all three CNI parameters showed the expected positive relations with openness, suggesting that those who are more open are more sensitive to consequences, more sensitive to moral norms, and show a greater preference for inaction versus action. Results of exploratory analyses further revealed relations between the C parameter and agreeableness as well as the I parameter and all Big Five personality traits. However, given that these findings were not obtained in prior work and were the product of exploratory analyses, we refrain from interpreting these effects.

## 4. General discussion

Recent research suggests that disagreement in moral-dilemma judgments may be rooted in basic personality traits, in that basic personality traits are systematically related to different factors underlying moral-dilemma judgments (Kroneisen & Heck, 2020; Luke & Gawronski, 2022). Given that this line of research has been limited to a small number of studies, the purpose of the current research was to add to this literature by replicating prior associations between the Big Five personality traits and distinct factors underlying moral-dilemma judgments. To this end, we conducted two preregistered studies: one consisting of a sample from a student population (Study 1) and one consisting of a sample from an online worker population (Study 2). In both studies, the Big Five personality traits were measured according to the BFI-2-S (Soto & John, 2017a), and moral-dilemma judgments were analyzed using the CNI model to disentangle sensitivity to consequences, sensitivity to moral norms, and general preference for inaction versus action (Gawronski et al., 2017).

Based on a reanalysis of data by Luke and Gawronski (2022) (see Table 1), we tested six preregistered hypotheses regarding correlations between Big Five personality traits and CNI parameters. For extraversion, we expected a negative correlation with the C parameter such that higher levels of extraversion are associated with weaker sensitivity to consequences (Hypothesis 1). For agreeableness, we expected a positive correlation with the N parameter such that higher levels of agreeableness are associated with stronger sensitivity to moral norms (Hypothesis 2). For conscientiousness, we expected a positive correlation with the N parameter such that higher levels of conscientiousness are associated with stronger sensitivity to moral norms (Hypothesis 3). Lastly, for openness, we expected a positive correlation with all three parameters such that higher levels of openness are associated with stronger sensitivity to consequences (Hypothesis 4a), stronger sensitivity to moral norms (Hypothesis 4b), and stronger general preference for inaction versus action (Hypotheses 4c).

The hypothesized positive relation between agreeableness and sensitivity to moral norms was obtained in both studies, suggesting that those higher in agreeableness are more sensitive to moral norms than those lower in agreeableness. One potential explanation for this relation raised by Smillie et al. (2021) draws on the fact that agreeableness has been characterized by the tendency to rely on social rules (e.g., DeYoung et al., 2007). To the extent that sensitivity to moral norms is driven by consideration of moral rules (e.g., Holyoak & Powell, 2016; Nichols & Mallon, 2006), increased reliance on rule-based decision-making may drive greater norm sensitivity among those who are more agreeable. In support of this account, politeness, an aspect of agreeableness reflecting increased reliance on social rules (DeYoung et al., 2007), has been predictive of increased deontological inclinations, controlling for the other aspects of basic personality traits (Smillie et al., 2021).

An alternative (but compatible) explanation raised by Luke and

Gawronski (2022) draws on the fact that agreeableness has also been characterized by the tendency to show empathic concern for others (Wilmut & Ones, 2022). To the extent that sensitivity to moral norms is driven by empathic concern for others (e.g., Conway & Gawronski, 2013; Körner et al., 2020), increased empathic concern may drive greater norm sensitivity among those who are more agreeable. To test this account, we conducted exploratory, facet-level multiple regression analyses examining whether compassion, a facet of agreeableness reflecting concern for other's well-being (Soto & John, 2017b), is predictive of sensitivity to moral norms, controlling for other facets of agreeableness. Using existing data from Luke and Gawronski (2022) and data from the current research (see Tables S8-9 in the Supplemental Online Materials), compassion facet scores showed a significant positive relation with the *N* parameter (when controlling for other agreeableness facets) in three of four samples, providing some evidence for a unique relation between compassion and sensitivity to moral norms. Nevertheless, we urge caution in the interpretation of these findings given that the relation was nonsignificant in one sample (Time 2; Luke & Gawronski, 2022) and each facet was measured using only two items, rendering the validity of facet scores suboptimal (Soto & John, 2019). Nevertheless, we deem facet-level analyses to be a promising avenue for future research to clarify which facets of agreeableness might drive increased sensitivity to moral norms (e.g., Smillie et al., 2021).

Beyond the relation between agreeableness and sensitivity to moral norms, support for the other five hypothesized relations were dependent on the study. Drawing on a student sample, Study 1 did not provide support for any other hypothesized relations. In contrast, when drawing on an online worker sample, the results of Study 2 supported all hypothesized relations. Given these discrepancies, we consider three potential explanations that may account for the discrepant findings across studies: (1) the findings from Study 1 reflect false negatives, (2) the findings from the reanalysis of data from Luke and Gawronski (2022) and Study 2 reflect false positives, or (3) the discrepant findings are systematically related to characteristics of the sample.

Beginning with the first explanation, one possibility is that the null findings from Study 1 reflect false negatives. On this point, one major difference between Study 1 and Study 2 is the absence of data quality measures in Study 1. Whereas Study 2 included a reading-intensive attention check that was also included in prior work (Luke & Gawronski, 2022), Study 1 did not include any such measures. If the significant correlations obtained in our reanalysis of prior work and Study 2 become non-significant in the absence of our attention-check exclusion criteria, then the presence of data quality measures may account for the discrepant findings and suggest that the null findings from Study 1 reflect false negatives. To evaluate this possibility, we conducted a reanalysis of data from prior work (Luke & Gawronski, 2022) and from Study 2 without excluding participants who failed the attention check. When conducting correlational analyses including these inattentive participants, our results were unchanged in terms of significance. The only exception was the marginal relation between openness and the *C* parameter in data at Time 2 from prior research, which rose to significance (see Tables S10-11 in the Supplemental Online Materials). Given that the findings from prior work and Study 2 were unchanged when including data from inattentive participants, presence of data quality measures does not account for our discrepant findings.

Although data quality measures may not account for the discrepant findings, it is still possible that the data quality was worse in Study 1 than in Study 2, which would support the idea that the null findings from Study 1 were false negatives. To test this idea, we further compared the measurement reliability of CNI parameter estimates and personality trait scores in the data from Study 1 to the data from Study 2 (Table 4) and data at Time 1 and Time 2 from prior research (Luke & Gawronski, 2022; Table S12 in the Supplemental Online Materials). If measurement reliability is lower in Study 1 than in the other samples, then greater measurement error in Study 1 may account for the discrepant findings. While estimates of internal consistency for the Big Five personality traits

were largely comparable across samples, estimates of internal consistency for the CNI parameters showed some unexpected differences. Specifically, the internal consistencies of the *N* ( $\alpha_{S1} = 0.51$ ;  $\alpha_{S2} = 0.85$ ;  $\alpha_{T1} = 0.79$ ;  $\alpha_{T2} = 0.74$ ) and *I* parameters ( $\alpha_{S1} = 0.25$ ;  $\alpha_{S2} = 0.66$ ;  $\alpha_{T1} = 0.50$ ;  $\alpha_{T2} = 0.37$ ) were consistently lower in Study 1 compared to the other samples. Differences in the internal consistency of the *C* parameter were less reliable, with Study 1 ( $\alpha = 0.61$ ) showing higher internal consistency in the *C* parameter in comparison to Study 2 ( $\alpha = 0.47$ ) but lower internal consistency in comparison to Time 1 ( $\alpha = 0.71$ ) and Time 2 ( $\alpha = 0.73$ ) data from prior research (Luke & Gawronski, 2022). Given that four of our six hypothesized relations either included the *N* or *I* parameter as a moral-judgment variable, it is possible that greater measurement error in Study 1 than in the other samples contributed to our discrepant findings, which is consistent with the idea that findings from Study 1 reflect false negatives.

In addition to poorer data quality, it is also possible that the student sample from Study 1 was more homogeneous compared to the online worker samples (Buhrmester et al., 2016), resulting in restricted variability in individual-difference measures. If so, Study 1 may suffer from lower statistical power to detect existing correlations between measures, potentially increasing the rate of false negatives. To evaluate this possibility, we conducted supplemental analyses testing differences in variance in moral judgment and personality variables between the student sample in Study 1 and the online worker samples in Study 2 and prior research (Luke & Gawronski, 2022). Results indicated that variance in openness scores and the *N* parameter significantly differed between the student sample and each of the other samples, with the student population varying less in their levels of openness and sensitivity to moral norms in comparison to online worker populations (see Table S13 in the Supplemental Online Materials). Variance did not reliably differ across comparisons for any other personality or moral-judgment variables. Given that five of our six hypothesized relations either included openness as a personality trait or the *N* parameter as a moral-judgment variable, these supplemental analyses suggest that the restricted variance in sensitivity to moral norms and openness in the student sample may have contributed to our discrepant findings.

Moving to the second explanation, another possibility is that findings from the reanalysis of data from Luke and Gawronski (2022) and Study 2 were false positives. On this point, it is possible that the online samples included participants who engaged in more careless responding than the student sample in Study 1, which could lead to artificial positive correlations. To the extent that (1) there is a greater proportion of careless responders in the online samples than the student sample, (2) careless responding on the BFI-2-S results in lower personality trait scores, and (3) careless responding on the moral dilemma battery results in lower CNI parameter estimates, then greater careless responding in the online samples could drive artificial positive correlations between personality trait scores and CNI parameter estimates. With regards to the first premise, note that a mixture of careless and intentional responders in the online samples is required, because purely intentional responding would not result in artificial correlations and purely careless responding would produce noise in individual-difference measures, resulting in expected correlations of  $r = 0.00$ . With regards to the second premise, careless responding on the BFI-2-S would result in expected personality trait scores near the scale midpoint (i.e., 3.00). Given that mean-level trait scores for extraversion, agreeableness, conscientiousness, and openness have been found to exceed the scale midpoint (Soto & John, 2017b), it is possible that careless responding could lead to lower scores for these traits. With regards to the third premise, careless responding on the moral dilemma battery would result in expected parameter estimates of 0.00 for the *C* and *N* parameters and 0.50 for the *I* parameter. Given that mean-level parameter estimates reliably exceed 0.00 for the *C* and *N* parameters and often exceed 0.50 for the *I* parameter (Körner et al., 2020), it is also possible that careless responding could lead to lower CNI parameter estimates.

Based on the preceding considerations, it is possible that higher rates

of careless responding in online samples could produce artificial positive correlations, which could account for some of our discrepant findings. Note that this explanation cannot account for our findings regarding the relation between agreeableness and sensitivity to moral norms because this relation was obtained across samples. Nor can this explanation account for the discrepant findings regarding the relation between extraversion and sensitivity to consequences because this relation was negative. Nevertheless, this explanation may account for the discrepant findings regarding relations involving conscientiousness and openness, which were positive and obtained only in online samples.

To evaluate this possibility empirically, we compared the measurement reliability and mean-level values of relevant individual-difference measures in the data from Study 1 to the data from Study 2 (Table 4) and data at Time 1 and Time 2 of prior research (Luke & Gawronski, 2022; Table S12 in the Supplemental Online Materials). Based on the idea that there is a greater proportion of careless responders in the online samples than the student sample (Premise 1), measurement reliability of relevant individual-difference measures might be expected to be lower in the online samples as compared to the student sample. Inconsistent with this expectation, previously mentioned supplemental analyses suggest that measurement reliability of individual-differences measures tended to be higher in online samples as compared to the student sample. Next, based on the idea that there is a greater proportion of careless responders in the online samples than the student sample (Premise 1) and careless responding on the moral dilemma battery results in lower CNI parameter estimates (Premise 3), mean-level values of the CNI parameters might be expected to be lower in the online samples as compared to the student sample. Consistent with this expectation, the mean scores of the *C* parameter ( $M_{S1} = 0.26$ ;  $M_{S2} = 0.13$ ;  $M_{T1} = 0.20$ ;  $M_{T2} = 0.20$ ), *N* parameter ( $M_{S1} = 0.58$ ;  $M_{S2} = 0.37$ ;  $M_{T1} = 0.48$ ;  $M_{T2} = 0.51$ ), and *I* parameter ( $M_{S1} = 0.56$ ;  $M_{S2} = 0.46$ ;  $M_{T1} = 0.49$ ;  $M_{T2} = 0.53$ ) were lower in the online samples than the student sample in Study 1. Finally, based on the idea that there is a greater proportion of careless responders in the online samples than the student sample (Premise 1) and careless responding on the BFI-2-S results in lower personality trait scores (Premise 2), mean-level values of conscientiousness and openness scores might also be expected to be lower in the online samples as compared to the student sample. Inconsistent with this expectation, the mean scores of conscientiousness ( $M_{S1} = 3.49$ ;  $M_{S2} = 3.58$ ;  $M_{T1} = 3.48$ ;  $M_{T2} = 3.53$ ) and openness ( $M_{S1} = 3.56$ ;  $M_{S2} = 3.49$ ;  $M_{T1} = 3.68$ ;  $M_{T2} = 3.70$ ) were more often higher in the online samples as compared to student sample in Study 1.

Taken together, supplemental analyses comparing measurement reliability and mean-level values of relevant individual-difference measures provide mixed support for the three conditions required to produce artificial positive correlations. Consistent with Premises 1 and 3, mean-level values of CNI parameter estimates were lower in the online samples as compared to the student sample. Yet, inconsistent with Premises 1 and 2, the mean-level values of conscientiousness and openness scores and measurement reliability across relevant individual-differences measures tended to be higher in the online samples as compared to the student sample. Given that all three premises are required to produce artificial positive correlations, these analyses do not support this explanation for false positives in the findings from prior data (Luke & Gawronski, 2022) and Study 2.<sup>9</sup>

<sup>9</sup> Although mean-level differences between samples on relevant personality traits scores and CNI parameter estimates should be sensitive to differences in careless responding, mean-level differences may also be impacted by genuine group differences between the student and online samples. Thus, we cannot completely rule out the idea that findings from the reanalysis of data from Luke and Gawronski (2022) and Study 2 reflect false positives due to artificial positive correlations, but our supplemental analyses on the measurement reliability and mean-level values of individual-difference measures do not support this explanation.

A final possibility is that the discrepant findings are systematically related to sample characteristics. Consistent with this possibility, a comparison of the demographic statistics between Studies 1 and 2 reveals notable differences in gender (Study 1: 72.00% females, 26.40% males; Study 2: 39.17% females, 60.00% males), age (Study 1:  $M = 18.72$ ; Study 2:  $M = 34.37$ ), Spanish, Hispanic, or Latino identification (Study 1: 30.00%, Study 2: 18.75%), and Asian identification (Study 1: 36.00%, Study 2: 4.58%). To test whether these differences might account for the obtained discrepancies, we conducted supplemental analyses examining whether each demographic characteristic moderated the hypothesized relations between Big Five trait scores and CNI parameters in data from prior research (Luke & Gawronski, 2022) and data from the current research. Given the restricted age range in the student sample from Study 1, we did not examine the moderating effect of age in this sample. Similarly, given the small proportion of Asian identification in the online samples from prior research and Study 2, we only examined the moderating effect of Asian identification in Study 1.

Overall, neither gender nor age reliably moderated any of the hypothesized relations across samples (see Tables S14-16 in the Supplemental Online Materials). Similarly, Hispanic identification did not reliably moderate any of the hypothesized relations across samples (see Tables S17-18 in the Supplemental Online Materials), apart from the relation between openness and sensitivity to moral norms which was significantly moderated by Hispanic identification in all samples but the student sample in Study 1. When breaking down this relation by Hispanic identification across the online samples, the relation was stronger for participants identifying as Hispanic ( $0.56 > r_s > 0.68$ ) in comparison to participants not identifying as Hispanic ( $0.19 > r_s > 0.32$ ). However, given that the student sample had a higher proportion of participants identifying as Hispanic than the online samples, this interaction effect cannot account for the null finding in Study 1 and therefore cannot account for the discrepancy between samples. Similarly, Asian identification did not moderate any of the hypothesized relations in Study 1 (see Table S19 in the Supplemental Online Materials), apart from the hypothesized negative relation between extraversion and sensitivity to consequences. Breaking down this relation by Asian identification, the relation remained nonsignificant both for those identifying as Asian ( $r = 0.14$ ,  $p = .199$ ) and those not identifying as Asian ( $r = -0.13$ ,  $p = .098$ ). Taken together, these supplemental analyses suggest that our discrepant findings are not due to differences in demographic characteristics between samples.

In sum, the first explanation received the strongest support, suggesting that the findings from Study 1 reflect false negatives. When comparing the student sample from Study 1 to the online worker samples from prior data (Luke & Gawronski, 2022) and Study 2, we observed lower internal consistencies in parameter estimates for the *N* and *I* parameter as well as lower variability in openness scores and parameter estimates for the *N* parameter. Taken together, these results suggest that greater measurement error and restricted variance in Study 1 may have reduced power to detect existing correlations, potentially resulting in false negatives. In contrast, we did not find reliable support that the findings from the reanalysis of data from Luke and Gawronski and Study 2 reflect false positives or that findings across samples are dependent on demographic characteristics.

With that said, the discrepant findings of the current research underscore the importance of replication and sampling diversity when replicating psychological effects. As noted in their seminal article, Henrich and colleagues (2010) argued that psychological research oversamples from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies. Consequently, psychological findings obtained in samples with these characteristics may not necessarily generalize to the wider population. Past research has already demonstrated the problem of restricted sampling for understanding moral judgments (Apicella et al., 2020; Henrich et al., 2010), with studies suggesting cross-cultural variation in moral judgment (e.g., Awad et al., 2018; Haidt & Graham, 2007) and in relations between basic personality traits

and moral judgments specifically (Alper & Yilmaz, 2019). Although relations between basic personality traits and moral-dilemma judgments replicated in the more heterogeneous sample of online workers and findings from the student sample may reflect false negatives, we deem it crucial for future research to continue examining the replicability of relations between basic personality traits and moral-dilemma judgments across a diverse range of samples. In doing so, this research can provide additional clarity to our discrepant findings as well as identify potential moderators of the degree to which moral disagreements are rooted in basic personality dimensions.

Assuming the findings from Study 2 do not reflect false positives, the results of this study replicate prior work (Luke & Gawronski, 2022) and have implications for moral and personality psychology. Consistent with our preregistered hypothesis, Study 2 provided evidence for a negative relation between extraversion and sensitivity to consequences, suggesting that those higher in extraversion are less sensitive to consequences than those lower in extraversion. One possible explanation for this relation can be drawn from the fact that extraversion has been characterized by the tendency to be more sensitive to social rewards (Smillie et al., 2019), particularly in the form of social attention (Ashton et al., 2002). To the extent that outcome-maximizing judgments garner reduced perceptions of moral character (e.g., Bostyn & Roets, 2017b; Everett et al., 2016; Sacco et al., 2017), sensitivity to negative social evaluations of others might drive reduced sensitivity to consequences among those who are more extraverted. However, challenging this account, recent research using the CNI model suggests that perceptions of moral character are predicted by a stronger sensitivity to moral norms and are unrelated to sensitivity to consequences (Gawronski, 2022).<sup>10</sup> Nevertheless, it is still possible that people assume others will evaluate outcome maximizing judgments negatively (e.g., Rom & Conway, 2018), driving reduced sensitivity to consequences among those who are more extraverted. Future research might further examine this possibility by examining sensitivity to social rewards (e.g., social attention; Ashton et al., 2002) as a potential mediator to clarify how extraversion might drive reduced sensitivity to consequences (Luke & Gawronski, 2022).

In addition to the relation between extraversion and sensitivity to consequences, Study 2 also supported the hypothesized relation between conscientiousness and sensitivity to moral norms, suggesting that those higher in conscientiousness are more sensitive to moral norms than those lower in conscientiousness. Similar to the relation between agreeableness and sensitivity to moral norms, one potential explanation for the relation between conscientiousness and sensitivity to moral norms draws on the fact that conscientiousness has been characterized by the tendency to fulfill obligations and follow rules (Jackson & Roberts, 2017). To the extent that sensitivity to moral norms is driven by consideration of moral rules (e.g., Holyoak & Powell, 2016; Nichols & Mallon, 2006), increased reliance on rule-based decision-making may therefore drive greater sensitivity to moral norms among those higher in conscientiousness. To test this account, future research might examine reliance on rule-based processing as a potential mediator of the relation between conscientiousness and greater norm sensitivity.

Finally, Study 2 provided evidence for relations between openness and all three factors underlying moral dilemma judgments, suggesting that those higher in openness are more sensitive to consequences, more sensitive to moral norms, and show a stronger preference for inaction versus action than those lower in openness. Drawing on the fact that openness is a trait characterized by the tendency to engage in complex cognitive processing (DeYoung, 2015) and the idea that sensitivity to consequences is driven by deliberative cognitive processing (Greene, 2007), it is plausible that cognitive deliberation may drive increased

sensitivity to consequences among those who are more open (Smillie et al., 2021). In support of this account, intellect, an aspect of openness reflecting cognitive deliberation and exploration of ideas (DeYoung et al., 2007), has been predictive of increased utilitarian inclinations, controlling for the other aspects of basic personality traits (Smillie et al., 2021). Yet, despite this finding, research using the CNI model has challenged the idea that sensitivity to consequences is the product of cognitive deliberation, with several studies suggesting that manipulation of cognitive load impacts moral-dilemma judgments via general action aversion rather than sensitivity to consequences (Gawronski et al., 2017, Studies 2a-2b).

An alternative account that is compatible with prior findings and provides an explanation for the relation between openness and all three factors underlying moral judgments draws on the idea of moral reflection (Luke & Gawronski, 2022). As previously mentioned, openness is a trait that has been characterized by complex cognition functioning (DeYoung, 2015). In the context of morality, the tendency to seek and appreciate complex patterns may be expressed as stronger reflection on moral issues generally (e.g., Reynolds, 2008; Vanaman et al., 2019), promoting more systematic patterns of moral judgments. Consequently, greater moral reflection may drive a greater sensitivity to maximizing consequences and adhering to relevant moral norms among those who are more open. Likewise, given that a general pattern of inaction responses in moral dilemmas can reflect the tendency to judge harm caused by action (i.e., actively causing harm) more harshly than harm caused by inaction (i.e., not preventing harm; Cushman et al., 2006), greater moral reflection may also drive general inaction preferences among those more open.

To test this account, we conducted exploratory, facet-level multiple regression analyses examining whether intellectual curiosity, a facet of openness reflecting joy for thinking (Soto & John, 2017b), is predictive of the three factors underlying moral-dilemma judgments, controlling for other facets of openness. Using existing data from Luke and Gawronski (2022) and data from the current research (see Tables S8-9 in the Supplemental Online Materials), intellectual curiosity facet scores were not reliably related with any of the three model parameters across the four samples. However, as in the supplemental analyses examining the relation between compassion and sensitivity to moral norms, we refrain from drawing strong conclusions from these results given that each facet was measured only using only two items, rendering the validity of facet scores suboptimal (Soto & John, 2019). Further facet-level analyses with more extended measures of personality (e.g., BFI-2; Soto & John, 2017b) would be a promising avenue for future research to clarify which facets of openness might drive relations with the three factors underlying moral-dilemma judgments.

Before concluding, it is worth noting several limitations in the current research. First, the current research conceptualized basic personality traits exclusively according to the Big Five model (John et al., 2008). Although prominent in personality psychology and predictive of a wide range of important life outcomes (e.g., Ozer and Benet-Martinez, 2006), the Big Five model is but one of many models of personality. Notably, Kroneisen and Heck (2020) examined relations between basic personality traits and factors underlying moral-dilemma judgments using the HEXACO model (Ashton & Lee, 2007). Given the conceptual differences between several traits in the Big Five and HEXACO models as well as the fact that the HEXACO model additionally includes Honesty-Humility as a trait that has been closely linked to morality (Ashton et al., 2014), future work employing measures of the HEXACO is needed to provide a more complete understanding of moral judgment and personality. Second, although we do not find strong evidence for demographic characteristics as moderators of relations between basic personality traits and moral-dilemma judgments, these relations might be moderated by other characteristics beyond those considered in the present research (e.g., cultural characteristics; Alper & Yilmaz, 2019). Because both studies in the current research recruited U.S. samples, our data cannot shed light on the possibility. Thus, we deem it important for

<sup>10</sup> It is worth noting that perceived morality showed significant zero-order correlations with both sensitivity to consequences and sensitivity to moral norms. However, only the positive relation between perceived morality and sensitivity to moral norms persisted after controlling for perceived influence.

future research to continue examining these questions in the context of other cultures.

## 5. Conclusion

An emerging line of research suggests a link between basic personality traits and different factors underlying moral-dilemma judgments. The purpose of the current research was to replicate and build on prior studies by examining relations between the Big Five personality traits and factors underlying moral-dilemma judgments. Across two preregistered studies, results were mixed, in that only one out of six previously obtained relations replicated in a student sample (Study 1) whereas all six previously obtained relations replicated in an online worker sample (Study 2). While these findings provide additional support for the idea that moral disagreements can be rooted in basic personality traits, they also stress the importance of replication in future research using diverse samples.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Author Contributions

D.L. and B.G. designed the study; D.L. collected and analyzed the data; D.L. drafted an initial version of the manuscript; B.G. revised the initial version of the manuscript; D.L. and B.G. revised the manuscript in response to peer-review. All authors approved the final version for submission.

## Open Practices

The preregistration for Study 1 can be accessed at <https://osf.io/vgwue> and the preregistration for Study 2 can be accessed at <https://osf.io/pu2wd>. All data, syntax, and materials can be accessed at <https://osf.io/382yh/>.

## Appendix A. CNI model equations

Model equations for the estimation of sensitivity to consequences (C), sensitivity to moral norms (N), and general preference for inaction versus action irrespective of consequences and norms (I) in responses to moral dilemmas with proscription versus prescription norms and benefits of action for overall well-being that are either greater or smaller than the costs of action for well-being. Reproduced from Gawronski et al. (2017). Reprinted with permission from the American Psychological Association.

$$p(\text{inaction} \mid \text{proscriptive norm, benefits} > \text{costs}) = [(1 - C) \times N] + [(1 - C) \times (1 - N) \times I].$$

$$p(\text{inaction} \mid \text{proscriptive norm, benefits} < \text{costs}) = C + [(1 - C) \times N] + [(1 - C) \times (1 - N) \times I].$$

$$p(\text{inaction} \mid \text{prescriptive norm, benefits} > \text{costs}) = (1 - C) \times (1 - N) \times I.$$

$$p(\text{inaction} \mid \text{prescriptive norm, benefits} < \text{costs}) = C + [(1 - C) \times (1 - N) \times I].$$

$$p(\text{action} \mid \text{proscriptive norm, benefits} > \text{costs}) = C + [(1 - C) \times (1 - N) \times (1 - I)].$$

$$p(\text{action} \mid \text{proscriptive norm, benefits} < \text{costs}) = (1 - C) \times (1 - N) \times$$

$$(1 - I).$$

$$p(\text{action} \mid \text{prescriptive norm, benefits} > \text{costs}) = C + [(1 - C) \times N] + [(1 - C) \times (1 - N) \times (1 - I)].$$

$$p(\text{action} \mid \text{prescriptive norm, benefits} < \text{costs}) = [(1 - C) \times N] + [(1 - C) \times (1 - N) \times (1 - I)].$$

## Appendix B. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jrp.2022.104297>.

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