Induced guilt and more self-disciplined moral standards in moral dilemma judgment

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ABSTRACT

Objective: The current study attempts to adopt more comprehensive and rigorous methods to deconstruct and confirm the association between guilt and moral dilemma judgements, with the expectation of providing new insights for related research.

Methods: A total of 170 college participants were employed in separate batches for the experiment, including 53 males and 117 females, ranging from 17 to 28 years old (M = 20.88, SD = 2.29). We first induced guilt in the subjects using recalling and writing tasks and then asked the participants to complete the moral dilemma judgement tasks.

Results: Results of the analysis using traditional methods showed no association between induced guilt and moral dilemma judgements. However, the results of the process dissociation analysis indicated that induced guilt is related to higher deontological inclination. Moreover, the CNI model analysis revealed that induced guilt has a stronger sensitivity to moral norms.

Conclusion: Induced guilt was associated with a stronger sensitivity to moral norms, which is reflected in less violation and more compliance with moral norms. There was no direct relation between induced guilt and the sensitivity to consequences and a general preference for action in moral decision-making.

KEY POINTS

What is already known about this topic:
(1) Previous findings on the relation of guilt in moral decision-making were not consistent.
(2) The traditional approach treats utilitarianism and deontology as bipolar opposites, which may further confound the relation between guilt and moral decision-making.
(3) Numerous studies imply that guilt increases other-oriented empathy and emotional concern for the victims.

What this topic adds:
(1) Induced Guilt is associated with higher sensitivity to moral norms and will discipline one’s behaviour to be more in line with ethical standards.
(2) Induced Guilt is unrelated to utilitarian decisions about the well-being of the majority and is not involved in the inhibition and activation of action.
(3) The current study used more comprehensive and rigorous methods to clarify the potential confounding factors.

Moral decision-making is defined as assessing the acceptability of behaviours or other moral characteristics in hypothetical moral dilemmas. Utilitarianism and deontology are the two core indicators of moral decision-making (Greene, 2007). Utilitarianism reflects a concern for consequences and maximizing well-being. On the other hand, deontology reflects a concern for moral norms and standards. For a longer period, the prevailing view was that only rational reasoning played a dominant role in making moral decisions. This view overemphasized the importance of cognitive reasoning and neglected the function of emotion in moral psychology, and was thus challenged by some scholars (Greene et al., 2008; Haidt, 2001). After that, the social intuition model and the dual-process theory emphasized the important role of emotion in moral decision-making (e.g., Greene et al., 2001; Greene, 2007; Haidt, 2001). According to the dual-process theory, there are two independent processes in moral decision-making: one is the cognitive process and the other is the emotional process (Greene & Haidt, 2002). The final decision outcome depends on the relative strength of these two processes. Some studies found that utilitarianism...
stems from rational thinking about the costs and benefits of the consequences of decisions, while deontology derives from the automatic emotional responses to the idea of causing harm (e.g., Reynolds & Conway, 2018; Valdesolo & DeSteno, 2006).

Although guilt has long been viewed as an emotion highly associated with morality, there is currently no consensus on the relationship between them. There are several possible reasons for this. First, different dilemmas may hinder the clarification of the results. To address that, the CNI model provides a series of manipulated dilemmas (i.e., manipulation of consequences and norms) that have sufficient ecological validity (Gawronska et al., 2017). Second, it is about time and ways of inducing guilt. Some studies have found that guilt arises during moral decision-making (Choe & Min, 2011; Haidt, 2007), but this guilt is a post-action emotion in their study, and some scholars argue that guilt does not arise when individuals do not believe they have done something wrong (Jackson et al., 2016; McAuliffe, 2019). Therefore, it is necessary to induce guilt prior to moral decision-making. In addition, a recent theory argued that people might have both utilitarian and deontological intuitions (Bago & De Neys, 2019). If this argument is followed, then decision-makers who prefer utilitarianism do not feel guilty even if they violate moral norms. Situational simulation has been used in some studies to induce guilt, but this inducing method is difficult to focus on and may induce other unrelated emotions. Therefore, this study used a relatively direct method of immersive thinking and writing tasks to induce guilt in the subjects. Finally, it is about the methodological issues. The traditional approach of treating utilitarianism and deontology as polar opposites may further confound the interpretation of results. Therefore, the current study aims to try to address these issues.

**The relation between guilt and moral decision making**

Theoretically, guilt results from introspection and is a moral emotion closely related to transgressions (Ferguson et al., 1991; Sabini & Silver, 1997). The dual process theory of moral decision-making suggests that deontology stems from an automatic emotional response to victims (Greene, 2007; Valdesolo & DeSteno, 2006). Guilt increases other-oriented empathy and exhibits more moral intentions and behaviours (Körner et al., 2020; Tangney & Dearing, 2002; Tangney et al., 2007). Agents in a state of guilt are more likely to exhibit more compensatory behaviors to eliminate emotional distress and promote motivation to make amends and constructive, proactive behavioural pursuits (Tangney et al., 2007). Guilt has long been regarded as a moral emotion and plays an important role in making positive moral decisions (Tangney et al., 2007). Takahashi et al. (2004) demonstrated that the guilt state activates the medial prefrontal cortex (MPFC), the left posterior superior temporal sulcus (STS), and the visual cortex. Hence, guilt is a self-conscious emotion. Moral emotions often motivate people to do good and avoid doing bad things (Kroll & Egan, 2004). The psychoanalytic theory considers guilt to sanction impulses and desires that violate internal moral norms, while the interpersonal theory suggests that guilt stems from hurting others or failing to help them (Baumeister et al., 1994). People often feel guilty when making moral dilemma judgements as they are compelled to harm one party in such scenarios (Greene & Haidt, 2002; Haidt, 2007). Harming others is not acceptable to moral norms. From this perspective, guilt prohibits the violation of moral standards and motivates remedial actions such as apology, repentance, and atonement. Overall, these findings imply a possible link between guilt and moral dilemma judgment.

Some studies have argued that guilt, a negative valence emotion, can motivate people to make more moral choices (Johnson & Connelly, 2016; Tangney, 1996). Koenigs et al. (2007) found that damage to the ventromedial prefrontal cortex (vmPFC) results in a deficit of guilt and further increases utilitarian decisions. Higgs et al. (2020) used a low-fidelity simulation of the situation to induce guilt in their participants and found that those who experienced guilt will make amends for their wrongdoing. Choe and Min (2011) used 25 personal moral scenarios and asked participants to report on their emotions when making moral decisions. They found that guilt dominated 12 of the dilemmas. But it is noted that the guilt in their study is more likely to be a post-action emotion, as the emotion is reported by the agents only after the decision had been completed. However, the recent theory argued that almost no evidence that discrete emotions influence moral decision-making (Cameron et al., 2013). Choe and Min (2011) also found that trait guilt was not associated with moral decision-making. Violating moral norms may not make individuals feel guilt in recent research. For instance, Jackson et al. (2016) proposed that manipulated participants do not feel guilty despite they believed that it was wrong to violate moral norms. Instead, negative
anticipation or social evaluations following norm violations are more likely to moderate individuals’ decisions. They usually do not spontaneously feel guilty when people do not believe they have done something wrong. These views revealed that guilt in moral decision-making is not always reliable if it is a post-action emotion. Therefore, it is necessary to induce guilt first in exploring the role of guilt in moral decision-making. McAuliffe (2019) also presented that it is difficult to establish a direct relationship between guilt and moral decision-making. In sum, this relationship needs to be further investigated.

**Methodological limitations and solutions**

As we mentioned before, the traditional approach may further hinder the interpretations of the results. There are two main confounding factors in the traditional approach (Gawronski et al., 2017). (a) In the traditional approach, utilitarianism and deontology are assumed to be bipolar opposites (Conway & Gawronski, 2013). For example, In the typical trolley dilemma, participants are often asked to decide whether to pull a lever to kill one person to save another five, or to refuse to harm the one. Choosing to kill 1 to save 5 is interpreted as utilitarianism, while refusing to harm 1 reflects a preference for deontology. This implies that utilitarianism and deontology are in complete conflict with each other in the traditional approach. However, the dual-process theory of moral decision-making emphasized that the two are independent of each other. Thus, the traditional approach confounds choosing one option with rejecting the other. (b) The traditional approach ignores general preference for action independent of consequences and moral norms. In other words, in the traditional approach, accepting action reflects utilitarianism (accepting the happiness of the greatest number of people), while refusing action reflects deontology (rejecting harmful actions that violate moral norms). Therefore, the choice of not pulling the lever in the trolley dilemma represents the existence of three possibilities. First, the agents have strong norm sensitivity and are opposed to violating moral norms. Second, the agents have less consequence sensitivity and do not reject deontological principles. Third, without considering consequences and norms, the agents simply have a pure preference for inaction. In sum, the above factors confound the interpretation of the results in the traditional approach.

The process dissociation (PD) paradigm proposed by Conway and Gawronski (2013) solved the first problem of the traditional approach. Since the dual-process theory of moral decision-making considers utilitarianism and deontology to be conceptually different, the possibility exists for both tendencies to be activated simultaneously. The core of the process dissociation paradigm is to compare agents’ responses by setting up dilemmas with different consequences (e.g., actions with consequences greater than and less than the costs). Utilitarianism and deontology lead to different responses in incongruent trials (i.e., dilemmas in which the benefits of action are greater than the costs), whereas congruent trials lead to the same responses (i.e., dilemmas in which the benefits of action are less than the costs). Thus, the process dissociation paradigm manipulates the consequences of choice. For example, in the trolley dilemma, killing 1 person to save 5 is incongruent because deontology rejects it while utilitarianism tends to accept it. But what if only 1 person is killed and not saved in the trolley dilemma? Then the utilitarian and deontological responses are congruent because neither of them would accept such an act of harm. The process dissociation paradigm allows us to quantify both utilitarian and deontological inclinations independently and to be more explicit about whether positive results are caused by an increase in deontological inclinations or a decrease in utilitarian inclinations or both.

To address both problems in the traditional approach, the CNI model was proposed by Gawronski et al. (2017). The essence of the CNI model is a multinomial processing tree (MPT) model. It allows researchers to separate multiple potential cognitive processes under categorical responses. Using the maximum likelihood estimation, the CNI model is based on empirically observed four parallel versions of action versus inaction in moral dilemmas to estimate the values of the three model parameters. Thus, this model allows researchers to quantify three parameters: (a) sensitivity to consequences (C parameter), (b) sensitivity to moral norms (N parameter), and (c) general preference for action or inaction without regard to consequences and norms (I parameter). Each of these three parameters represents the probability of certain cognitive processes occurring. Conceptually, utilitarian decisions are defined as being sensitive to consequences. Therefore, to categorize a given decision as a utilitarian response, it is necessary to identify its consequences-sensitive properties. This requires the researcher to manipulate different consequences and make comparisons. For example, comparing the killing of 1 to save 5 scenario in the trolley dilemma with the killing 1 without saving scenario. These two scenarios differ in their consequences. Similarly, deontological decisions are defined as being sensitive to moral norms. Thus, it is imperative to determine its norm-
sensitive properties to categorize a given decision as a deontological response (Gawronski & Beer, 2017). For example, comparing prescriptive norms (specifying what people should not do) with prescriptive norms (specifying what people should do). Besides, the CNI model also quantifies the general preference for action over inaction without regard to consequences and norms. In sum, manipulating moral norms (proscriptive vs prescriptive norm) and separating generalized inaction/action preferences are the major contributions of the CNI model compared to the process dissociation paradigm. This model better addresses two problems with the traditional approach and provides new insights for many studies (e.g., Gawronski & Brannon, 2020; Gawronski et al., 2018) (see Figure 1).

In addition, some scholars have questioned the CNI model (Baron & Goodwin, 2020; Heck et al., 2018; Liu & Liao, 2021). Heck et al. (2018) fitted the CNI model using a Bayesian hierarchical approach to multinomial processing tree modelling (Matzke et al., 2015). This method used the Markov chain Monte Carlo (MCMC) approach to fit Bayesian hierarchical MPT (HMPT) models and continuous predictors, extending the standard MPT model by using generalized linear regression to model each parameter. The method improves over the traditional method because it accounts for between-person variability while at the same time retaining the benefits of aggregation (Klauer, 2010). Liu and Liao (2021) also proposed the CAN algorithm to solve the problem of a sequential processing pattern in the CNI model. Therefore, we also used these two methods to further validate our results (see Tables A1 and A2 in Appendix).

**Aims of this study**

The purpose of the current study is to examine the role of guilt in moral decision-making. As we mentioned above, although guilt arises when making moral dilemma judgements (Tangney et al., 2007), recent studies argued that the relationship between guilt and moral decision-making is not always reliable and therefore requires further research (Jackson et al., 2016; McAuliffe, 2019). According to the dual-process theory, deontology is rooted in an emotional response to harming others. Several studies have shown that guilt increases empathy for others, promotes interpersonal relationships, and reduces moral violations (Baumeister et al., 1994; Tangney et al., 2007). In addition, Körner et al. (2020) found a positive correlation between empathy and norm sensitivity. Therefore, based on relevant theory and previous research, we attempted to use more comprehensive and rigorous methods to confirm that guilt is associated with increased sensitivity to moral norms.

**Materials and methods**

**Participants and procedures**

The sample size was determined based on meta-analytic data from Lench et al. (2011), who reported an average effect of $d = 0.45$ for autobiographical recall on emotion-related outcomes. Therefore, when setting the effect size $d = 0.45$, $\alpha = 0.05$, and statistical test power of 0.8, 158 participants were required for the calculation. A total of 170 college students (53 males and 117 females), aged from 17 to 28 years old ($M =$...
20.88, $SD = 2.29$), were recruited for this study, which provided a statistical test power of 0.83 (two-tailed). All power analyses were conducted using GPower 3.1 (Faul et al., 2007). We obtained consent permission from each participant and each participant was paid after completing all tasks.

After obtaining written informed consent from the participants, they would be randomly assigned to the neutral group ($N = 85$, 24 males and 61 females, $M_{\text{age}} = 21.28$) and the guilt group ($N = 85$, 29 males and 56 females, $M_{\text{age}} = 20.47$). Both the groups performed recall and writing tasks to induce guilt, and this manipulation is effective in related experiments (Han et al., 2021; Polman & Ruttan, 2011). Participants in the guilt group were asked to spend 8 minutes recalling a personal life event that made them feel guilty. To enhance the recall effect, they were required to write down as many details and feelings about the event as possible. For the neutral group, they were asked to spend 8 minutes writing down the lab layout to avoid, as much as possible, their recall of any positive or negative life events. Afterwards, both groups of participants completed 24 moral dilemmas. Finally, the participants were paid and thanked.

**Measures**

**Moral dilemmas**

The present study used 24 moral dilemmas proposed by Gawronski et al. (2017), presented to participants in a fixed random order on a screen, in which they were asked to read the description of each dilemma and judge its acceptability (the choice of “yes” recorded as 1 and no as “0”). The 24 moral dilemmas consist of four parallel versions of the six fundamental moral dilemmas. These four parallel versions differ in terms of norms (prescriptive norm prohibiting action and prescriptive norm prescribing action) and consequences (benefits of actions outweighing costs and benefits of actions less than costs) (see Table 1).

**Manipulation checks**

After completing the writing task, participants reported three guilt-related items (guilt, remorse, and bad). The participants were required to rate each item from 1 (not at all) to 5 (very strong). We examined the effect of emotion elicitation by calculating the mean of the three items for each participant and comparing it to the neutral group.

**Statistical analyses**

We conducted the experiments using Psychopy software and analysed the results of the study by various methods. The traditional approach to moral decision-making treats utilitarianism and deontology as bipolar opposites, so the results calculated by the traditional approach only consider the prescriptive norm and the benefits of action outweigh the costs in the situation. In these six sets of dilemmas, subjects chose to accept (i.e., accepting the act of sacrificing the minority to save the majority) in response to what is in the dilemma is scored as 1, and not accepting (i.e., rejecting the act of sacrificing the minority) is scored as 0. The process dissociation paradigm manipulates the consequences of choices by setting up different dilemmas, which in turn quantify utilitarianism ($U$ parameter) and deontology ($D$ parameter), respectively. The traditional method and process dissociation analysis were completed on SPSS 25.0. Since the core

| Table 1. Example of the four parallel versions of the moral dilemma. |
|-------------------------------------------------------------|
| **Benefits of action greater than costs** | **Benefits of action smaller than costs** |
| **Proscriptive norm prohibits action** | You are the president of your country. A guerilla group operating in a conflict zone has abducted a journalist from your country and threatens to behead him if your government does not pay a ransom of one million dollars. The group will use the ransom money to buy weapons for their guerilla war, which will cause the deaths of many people. Congress has approved the payment of the ransom, but you have the power to veto the payment. | You are the president of your country. A guerilla group operating in a conflict zone has abducted a journalist from your country and threatens to behead him if your government does not pay a ransom of one million dollars. The group will use the ransom money to buy weapons for their guerilla war, which will cause the deaths of many people. Congress has approved the payment of the ransom, but you have the power to veto the payment. |
| **Prescriptive norm prescribes action** | Is it acceptable in this case to veto the ransom payment? You are the president of your country. A guerilla group operating in a conflict zone has abducted a journalist from your country and threatens to behead him if your government does not pay a ransom of one million dollars. The group will use the ransom money to buy food for their families, who live in an area that has been plagued by several droughts. As the president, you have the power to approve the payment of the ransom. | Is it acceptable in this case to approve the ransom payment? You are the president of your country. A guerilla group operating in a conflict zone has abducted a journalist from your country and threatens to behead him if your government does not pay a ransom of one million dollars. The group will use the ransom money to buy weapons for their guerilla war, which will cause the deaths of many people. As the president, you have the power to approve the payment of the ransom. |

Scores can range from 0 to 6. The neutral reference value of equal numbers of action and inaction responses is 3.

Source: Reproduced from Gawronski et al. (2017). Reproduced with permission from the American Psychological Association.
feature of utilitarianism is sensitivity to whether the consequences of a choice are beneficial to the majority, it is represented by consequence sensitivity (C parameter) in the CNI model. Similarly, a central feature of deontology is sensitivity to moral norms that are violated or adhered to, and thus is represented in the CNI model as norm sensitivity (N parameter). Besides that, the CNI model also separates general action/inaction preferences (l parameter). The CNI model was based on multiTree software and CNI template files (Gawronski et al., 2017; Moshagen, 2010).

Results

Manipulation check

We performed the manipulation check by calculating the average scores from the three items of guilt (Cronbach’s α = 0.92). The results showed that participants in the guilt group (M = 3.58, SD = 0.90) reported higher levels of guilt than those in the neutral group (M = 1.32, SD = 0.51), t (168) = 20.12, p < 0.001, d = 3.10.

Traditional approach

The traditional approach only focuses on one type of moral dilemma (prescriptive norm prohibits action, and the benefits of taking action outweigh the costs). It interprets preferences for action as utilitarian rather than deontological responses. The general preference for action/inaction in the traditional approach was obtained by comparing the mean of six sets of dilemmas (scores from 0 to 6) to the median theoretical value of 3 (50% probability of accepting and nonaccepting action in each dilemma). We calculated the means for six dilemmas of this type and found that the participants had no significant preference for generalized action or inaction, M = 3.02, SD = 1.40, t (169) = 0.17, p = 0.87.

Since several studies have revealed that age and gender differences influence moral decision-making, for example, women and older adults tend to express more deontological decisions compared to men and young adults (Gawronski et al., 2017; McNair et al., 2019), age and gender are controlled as covariates. After controlling for the effects of age and gender, we further compared the neutral group (M = 3.14, SD = 1.40) with the guilt group (M = 2.89, SD = 1.39) using the traditional method. The results indicated no significant differences between the two groups, F (1, 166) = 1.79, p = 0.18, ηp² = 0.01 (see Table 2).

Process-dissociation analysis

The process dissociation paradigm focuses only on the moral dilemmas of the proscriptive norm, but unlike the traditional approach, it manipulates the consequences (prohibitive norm prohibits actions and the benefits of actions are greater than and less than the costs). The process dissociation paradigm quantifies two parameters of utilitarianism (U parameter) and deontology (D parameter) to address the problem of treating utilitarianism and deontology as bipolar opposites in the traditional approach. Our process for calculating utilitarian and deontological inclinations is consistent with the procedure proposed by Conway and Gawronski (2013). We first standardized two parameters for subsequent analysis.

The results of the correlation analysis indicated that utilitarianism and deontology are two independent processes from each other, r = 0.09, p = 0.23. This is consistent with the dual-process theory of moral decision-making. After controlling for age and gender as covariates, the analysis showed no significant difference in utilitarian inclination between the two groups, F (1, 166) < 0.001, p = 0.99, ηp² = 0.001. In addition, the current results suggest that guilt is associated with a higher deontological inclination, F (1, 166) = 4.23, p = 0.04, ηp² = 0.03 (see Figure 2).

CNI model analysis

The CNI model showed a good fit when differences between groups were estimated, $G^2 (2) = 1.75, p = 0.42$. The participants in the guilt group (M = 0.44, 95% CI [0.39, 0.49]) showed significantly higher scores on the N parameter than the neutral group (M = 0.30, 95% CI [0.25, 0.36]), $ΔG^2 (1) = 14.11, p < 0.001, d = 0.58$, indicating

|                  | Benefits of action greater than costs | Benefits of action smaller than costs | Benefits of action greater than costs | Benefits of action greater than costs |
|------------------|---------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|
|                  | M          | 95% CI          | M          | 95% CI          | M          | 95% CI          | M          | 95% CI          |
| Guilt            | 2.89       | [2.59, 3.19]    | 1.52       | [1.25, 1.78]    | 4.89       | [4.67, 5.12]    | 3.72       | [3.42, 4.01]    |
| Neutral          | 3.14       | [2.83, 3.44]    | 1.74       | [1.48, 2.00]    | 4.44       | [4.23, 4.67]    | 3.30       | [3.04, 3.57]    |
that the agents in the guilt state were more sensitive to moral norms. In addition, there were no significant differences between the guilt group ($M = 0.41, 95\% \text{ CI} [0.36, 0.45]$) and neutral group ($M = 0.45, 95\% \text{ CI} [0.42, 0.49]$) on the I parameter, $\Delta G^2 (1) = 2.63, p = 0.10, d = 0.22$. Finally, the results revealed that the participants in the guilt group ($M = 0.21, 95\% \text{ CI} [0.17, 0.25]$) did not differ significantly from those in the neutral group ($M = 0.21, 95\% \text{ CI} [0.17, 0.25]$) on the C parameter, $\Delta G^2 (1) = 0.0001, p = 0.99, d = 0.002$ (see Figure 3).

Discussion

The main purpose of this study is to disentangle the potential mechanisms of guilt influencing moral decision-making. The results revealed induced guilt is not associated with deontological and utilitarian decisions. However, the process dissociation analysis indicated that induced guilt is associated with higher deontological inclination. Besides, results from the CNI analysis showed that induced guilt had a higher sensitivity to moral norms. Finally, we validated these findings again with more rigorous methods.

The traditional approach treated utilitarian and deontological decisions as bipolar opposites, which means that when decision-makers make utilitarian decisions, they will simultaneously deviate from deontology. And the traditional approach focused on only one type of moral dilemma (i.e., proscriptive norm

![Figure 2](image2.png)

*Figure 2. Process dissociation scores for the guilt and neutral groups. Error bars represent standard errors of the mean. * $p < 0.05$.

![Figure 3](image3.png)

*Figure 3. Estimates of three parameters for the guilt and neutral groups: consequences sensitivity ($C$), norm sensitivity ($N$), and generalized inaction versus action ($I$). Error bars depict standard errors of the mean. *** $p < 0.001$. 
prohibits action, and the benefits of action outweigh the costs). Therefore we can only obtain preliminary insights. The results of the traditional approach do not provide evidence for a relation between guilt and moral decision-making, which is in line with the findings of some scholars (Jackson et al., 2016; McAuliffe, 2019). One possible explanation is that the subjects in a state of guilt may have developed utilitarian intuitions and are not involved in too much rational cognition. Recently, Bago and De Neys (2019) also supported the possibility that people have both utilitarian and deontological intuitions. In such cases, the effect of deontological decisions could be offset by utilitarian intuitions. This may also explain the controversial results in the past. Considering the limitations of traditional methods, more rigorous methods are needed for further analysis.

The process dissociation paradigm further provides new insights into moral decision-making in the prescriptive norm. Unlike the traditional approach, the PD approach manipulates the consequences of the decision (i.e., benefits greater than the costs and benefits less than the costs). The results of the PD analysis indicated that guilt increases deontological inclination rather than decreases utilitarian inclination, consistent with our hypothesis. Guilt causes individuals to re-examine their moral standards and discipline their behaviours (Tangney & Dearing, 2002). It made them less likely to violate moral norms. Moreover, guilt is unlikely to reduce agents’ utilitarian inclination, because either utilitarianism or deontology reflects a positive concern for morality rather than ignorance of harm to others (Conway & Gawronski, 2013). The process dissociation paradigm resolved the first confounding factor in the traditional approach. However, this approach still failed to focus on the decision process in the prescriptive norm and could not further distinguish between a general preference for inaction and deontology. Therefore, the CNI model will give further explanations.

The CNI model further extended the prescriptive norm and manipulated the consequences in both moral norms (i.e., prescriptive norm and prescriptive norm). The CNI analysis showed that guilt had a higher sensitivity to moral norms, but did not affect consequence sensitivity or general action preferences. Numerous studies have shown that deontology is rooted in an emotional concern for harm to others (Haidt, 2007; Körner et al., 2020). Guilt motivates us to behave according to social standards and enhances other-oriented empathy (Tangney et al., 2007). Empirical studies also showed a positive correlation between empathy and sensitivity to moral norms (Körner et al., 2020). And Koenigs et al. (2007) noted that a lack of guilt and empathy leads to more utilitarian decisions. It is reasonable to speculate, therefore, that guilt may increase sensitivity to moral norms by increasing empathy for others. Guilt increases our motivation to engage in compensatory behaviours (Higgs et al., 2020). Likewise, inhibiting guilt is associated with more immoral judgements and intentions, when guilt is inhibited, immoral behaviours are evaluated as less immoral. Furthermore, other theories suggested that individuals experiencing guilt would feel acute pressure and quickly make up for their wrongdoing, improving consistency with moral norms (Klygge et al., 2013). From this perspective, behaving more ethically may be a strategy to avoid punishment (Ketelaar & Au, 2003; Sachdeva et al., 2009). Although Gawronski et al. (2018) found that sadness and anger do not influence moral decision-making, we cannot completely rule out the possibility that the effects of guilt may be driven by negative emotions rather than a discrete state of guilt, because guilt is a complex negative emotion. Finally, due to the shortcomings of the CNI model, we also used more rigorous methods to further validate these findings (see Tables A1 and A2 in Appendix).

Limitations and implications

Some limitations should be mentioned. We did not collect relevant biological indicators to further provide a more comprehensive understanding. Because guilt is a complex emotion, its underlying psychological mechanisms need more research to clarify. For example, the interpersonal and the psychoanalytic theories have different interpretations of guilt. The interpersonal theory argues that guilt arises from intentional or unintentional harm to others (Mancini & Gangemi, 2015), while psychoanalytic theory posits that guilt arises from the intervention of the superego and is unrelated to others. Thus further research is needed to clarify the potential confounds. The CNI model also has some inherent flaws, such as fewer observations that make individual-level outcomes tend to be unstable, and a fixed sequential processing pattern (C→N→I) that may lead to theoretical challenges.

The current study has theoretical and practical implications. We suggested that guilt was associated with higher sensitivity to moral norms. This finding
partially supports the dual process theory of moral decision-making, which posits that deontology is positively related to emotional concern for victims. Recent studies have shown that guilt expands empathy for others, increases helping behaviours, and decrease hurtful behaviours (Tangney et al., 2007). The current findings also coincide with psychoanalytic and interpersonal theory’s views on guilt. Guilt not only results in regulating our behavior and reducing moral disengagement; it also attempts to reduce one’s guilt by an increase in altruistic behavior. Moreover, from the practical perspective, appropriate guilt contributes to people reflecting on themselves and increasing the consistency of their behavior with moral norms. However, deliberately inducing guilt in others is still risky, and excessive guilt can be counterproductive, such as reducing self-esteem and increasing rumination thinking.

Disclosure statement
No potential conflict of interest was reported by the author(s).

Funding
The work was supported by the Foundation of Humanities and Social Science, Ministry of Education of the PRC [No. 18YJA190016].

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Data availability statement
The data described in this paper is publicly available in the Open Science Framework at [https://osf.io/8n2zg/](https://osf.io/8n2zg/).

Open Scholarship
This article has earned the Center for Open Science badges for Open Data, Open Materials and Preregistered. The data and materials are openly accessible at [https://osf.io/8n2zg/](https://osf.io/8n2zg/).

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Appendix

Table A1. Regression estimates and 95% Bayesian confidence intervals were obtained from latent-trait Bayesian hierarchical multinomial model.

| Predictors | C parameter | N parameter | I parameter |
|------------|-------------|-------------|-------------|
|            | β           | 95% BCI     | β           | 95% BCI     | β           | 95% BCI     |
| Group      | −0.11       | [−0.49, 0.27] | 0.99       | [0.38, 1.64] | −0.29       | [−0.63, 0.05] |
| Gender     | −0.04       | [−0.25, 0.19] | 0.17       | [−0.22, 0.57] | 0.00       | [−0.19, 0.19] |
| Age        | 0.01        | [−0.04, 0.06] | 0.07       | [−0.01, 0.15] | 0.02       | [−0.02, 0.06] |
| MG         | 0.06        | [−0.08, 0.19] | −0.20      | [−0.43, 0.02] | 0.08       | [−0.04, 0.20] |

To estimate the regression coefficients $\beta$ in the hierarchical CNI model with logistic regressions on all parameters, all predictors were $z$ standardized. Some of the variables are treated as dummy variables. For Group, 0 = Neutral group, 1 = Guilt group; For Gender, 0 = male, 1 = female. MG = Self-reported guilt arousal scores. BCI = Bayesian credibility interval.

Table A2. Testing the difference between envy and neutral emotions in moral decision-making with the CNI model (Gawronski et al., 2017) and CAN algorithm (Liu & Liao, 2021).

| Parameters | Results | Conclusion | Results | Parameters |
|------------|---------|------------|---------|------------|
| C          | $\Delta G^2 (1) = 0.0001$, $p = 0.99$, $d = 0.002$ | Identical | $t (168) = −0.04$, $p = 0.97$, $d = 0.01$ | C |
| N          | $\Delta G^2 (1) = 14.11$, $p = 0.001$, $d = 0.58$ | Identical | $t (168) = −2.58$, $p = 0.01$, $d = 0.40$ | N |
| I          | $\Delta G^2 (1) = 2.63$, $p = 0.10$, $d = 0.22$ | Identical | $t (168) = −0.97$, $p = 0.33$, $d = 0.15$ | A |

CAN algorithm