



# Am I guilty or not? Deontological guilt, uncertainty, and checking behavior

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## Summary

Literature suggests that checking behaviors are aimed at reducing feelings of uncertainty both in clinical samples with obsessive-compulsive disorder and in general population. Previous studies also showed that deontological guilt is an emotion often associated with obsessive-compulsive disorder. Thus, the aim of the current study was to investigate the differences in checking behaviors in the condition of high versus low uncertainty, by exploring the moderating role of deontological versus altruistic guilt. Participants were 108 undergraduate Italian university students who took part in a visual search task designed to elicit checking behavior. Ahead of the visual task, participants were administered one scenario in order to manipulate either deontological or altruistic guilt. The results showed that in the condition of uncertainty, compared with the condition of certainty, participants spent more time in checking behaviors and that such a difference was more consistent when participants experienced deontological rather than altruistic guilt. Limitations and further directions are discussed.

## KEYWORDS

altruistic guilt, checking behaviors, deontological guilt, obsessive-compulsive disorder, uncertainty

## 1 | INTRODUCTION

Obsessive-compulsive disorder (OCD) is characterized by several different types of compulsions that are performed with the intent to reduce negative feelings associated with intrusive, recurrent, and undesirable thoughts, images or impulses, named obsessions (American Psychiatric Association, 2013). Checking behaviors, that is, behaviors or mental acts that individuals feel obliged to perform repetitively until a certain goal is reached, are considered among the most common compulsions (Rachman, 2002). Several studies reported that checking is common both in clinical population, with a frequency of around 80% of people with OCD (Rasmussen & Tsuang, 1986) and in approximately 15% of the general population (Stein, Forde, Anderson, & Walker, 1997).

Previous work consistently found that feelings of uncertainty have an important role in fostering checking behaviors (Toffolo, van den Hout, Hooge, Engelhard, & Cath, 2013; Van den Hout & Kindt,

2004). According to this line of reasoning, checking behaviors are aimed at reducing disturbing feelings of uncertainty. Based on these previous findings, here we advance that the influence of uncertainty on checking behaviors can be understood mainly as an interference to the goal of avoiding and reducing deontological guilt, that is, the guilt originating from the violation of a rule, which characterizes OCD (D'Olimpio & Mancini, 2014; Mancini, 2018). In the next paragraphs, we briefly review the literature on uncertainty and checking behavior, and we will link it to research on deontological guilt in OCD.

### 1.1 | Uncertainty and checking behaviors

Previous literature found that checking is typically associated with uncertainty (Van den Hout, Engelhard, de Boer, du Bois, & Dek, 2008; Van den Hout & Kindt, 2004). This would suggest that, among OCD patients, uncertainty is aversive per se and that perseverative

checking could be motivated by the need to reduce uncertainty. Empirical research, however, demonstrated that checking behaviors are not effective in reducing uncertainty, but paradoxically, they increase such feelings (Coles, Radomsky, & Horng, 2006; Dek, van den Hout, Giele, & Engelhard, 2010; Van den Hout et al., 2009).

Two studies (Toffolo et al., 2013; Toffolo, van den Hout, Engelhard, Hooge, & Cath, 2014) recently provided evidence about the role of mild uncertainty on checking behaviors. More specifically, participants took part in a task in which they were asked to correctly identify, as rapidly as possible, a specific target (a closed square) among other similar figures (open squares). In half of the trials, the target was absent. This led to a sense of uncertainty because participants had to base their answers on a nonappearance of the target, which leaves room to a potential overlooking. In contrast, when the target was present, participants felt more certain about the answer. Greater uncertainty translated in more time spent searching for the target, which was the operationalization of checking behavior. Toffolo et al. (2013) found more checking behaviors in the condition of uncertainty, especially for participants with high obsessive-compulsive tendencies. In a subsequent study based on the same paradigm, Toffolo et al. (2014) checked more directly the role of uncertainty aversion as a potential explanation for increased checking in the uncertain condition. More specifically, before entering the task, individual differences on participants' intolerance of uncertainty (IU) were measured. Again, it was found that manipulated uncertainty (i.e., presence vs. absence of the target) determined checking behavior especially for those with high obsessive-compulsive scores. However, despite individuals with obsessive-compulsive tendencies showed much higher IU, controlling for IU did not change the results. This suggests that such variable does not play a major role in explaining the association between induced uncertainty and checking. Moreover, in the condition of uncertainty, participants with high obsessive-compulsive tendencies did not experience more uncertainty than participants with low obsessive-compulsive tendencies. All in all, this pattern of results indicates that there is more than pure aversion toward uncertainty in shaping checking behavior of individuals with obsessive-compulsive proclivity.

We propose that uncertainty might interfere with the goal of avoiding the feeling of guilt, which typically characterize individuals with OCD and that underlies their symptomatology (Arntz, Voncken, & Goosen, 2007; D'Olimpio & Mancini, 2014; Mancini & Gangemi, 2011; Shafraan, Watkins, & Charman, 1996). Indeed, guilt is associated with more symptomatic behaviors in people with OCD and with a greater severity of the disorder (Stewart & Shapiro, 2011). Moreover, several studies highlighted that promoting acceptance of guilt reduces such symptoms (Arntz et al., 2007; Cosentino et al., 2012).

In particular, research recently pointed out that OCD is linked to deontological guilt (Basile et al., 2011; D'Olimpio & Mancini, 2014; Mancini & Mancini, 2015). This type of guilt arises out of the assumption of having violated one's own moral rules even if nobody is harmed by such violation (e.g., cheating at school or consensual siblings sex). Deontological guilt involves feelings of unworthiness and expectations of punishment. Altruistic guilt, instead, originates from that appraisal that one's own conduct is not altruistic and is linked to others'

suffering, even if moral norms are not violated (e.g., breaking up with the partner).

Evidence for the distinction between deontological and altruistic guilt comes from neuroimaging research showing that these two different neural networks are implicated with the two types of guilt (Basile et al., 2011). Insula and the anterior cingulate cortex are more activated when deontological guilt is experienced, whereas medial prefrontal cortex would be associated with altruistic guilt. These findings indicate that altruistic guilt share the activation of the same brain areas of empathy, compassion, and with altruistic behaviors underlying the theory of mind (Shallice, 2001). Contrarily, deontological guilt shares the activation of insula with the feeling of disgust, self-reproach, and self-loathing (Rozin, Haidt, & McCauley, 1999).

D'Olimpio and Mancini (2014) showed that deontological (but not altruistic) guilt was associated with more checking and washing behaviors (D'Olimpio & Mancini, 2014). Interestingly, deontological guilt decreased after participants performed their checking behaviors. These findings strongly suggest that individuals with obsessive-compulsive tendencies are more concerned with reducing and preventing deontological guilt than altruistic guilt. This goal can be achieved by excluding categorically the responsibility of a rule violation, which might entail severe consequences in terms of moral status.

In the present work, we suggest that the feeling of uncertainty interferes with the goal associated to deontological guilt by reducing confidence in the conclusion that no rule has been violated. The set of rules provided in the present experiment was to be as accurate and quick as possible in the visual search task. It is also important to point out that there is no reason to advance that under altruistic guilt participants will simply ignore the given rules. We rather think that motivation to stick to rules will be more pronounced under deontological guilt because participants in that condition strive to reduce and avoid further deontological guilt that is strictly linked to the respect of abstract rules. The goal consisted into the respect of the two instructions about accuracy and speed of the visual search task: do not commit errors and to be quick as possible in the answers.

This reasoning is corroborated by research showing that confidence in decisions can be undermined by feeling uncertain (Ghosh & Ray, 1997; Huettel, Song, & McCarthy, 2005). Consistently, previous work also showed that the desire to avoid costly mistakes and respect the rules (e.g., not identifying the target as requested and being quick as possible) leads to reduced confidence and more search for diriment information (Mayseless & Kruglanski, 1987). Thus, confidence that any rule violation can be excluded is limited by uncertainty. This might lead to further checking as a mean to increase certainty that no violations (i.e., no errors) have been committed. When the goal of excluding rule violations is less emphasized, for example, in the case of altruistic guilt, uncertainty should be less influential in shaping such type of behaviors.

## 1.2 | The present study

The aim of the current research is to test the hypothesis that high (vs. low) uncertainty is associated with more checking behavior with this

pattern being stronger under deontological rather than altruistic guilt. The underlying hypothesized mechanisms are based on the interference that uncertainty plays in excluding a rule that has been violated. To test our hypothesis, we replicated the procedure developed by Toffolo et al. (2013, 2014). We reasoned that, depending on whether the target was present or not, participants felt uncertain about whether they complied with the rule provided by the experimenter, that is, to perform the task as accurately (but also quickly) as possible. Such potential rule violation, according to our reasoning, should have been more upsetting when deontological rather than altruistic guilt was induced in a previous task thus leading to spend more time on checking for the target.

## 2 | METHOD

### 2.1 | Participants and design

Participants were 108 undergraduate students (75% female;  $M_{\text{age}} = 20.94$ ,  $SD = 4.09$ ) in an Italian university. They were randomly assigned to conditions in a 2 (deontological vs. altruistic guilt)  $\times$  2 (present vs. absent target trials) design with the last factor within subject. Participants were given partial course credits for their participation in the study. Minimum sample size was determined before any data analyses were performed ( $N = 100$ ), and data collection was stopped when available lab time finished. Eight participants were excluded from the analyses for different reasons. More specifically, three participants were excluded because of the high number of errors on the main task ( $>80\%$ ) on either the absent or present trials. Three participants were excluded because of the length of the average response latency ( $>3.5$   $SD$ ) on either the absent or present trials. Two participants were excluded because inspection of manipulation checks revealed that the manipulation was not effective on them. More specifically, one participant in the altruistic guilt condition reported levels of deontological guilt that were close to extreme of the scale and distant from all other participants in the same condition. The other participant in the altruistic guilt condition reported extreme level of deontological guilt associated with low levels of altruistic guilt. Examination of standardized regression residuals suggests that both observations were unusual ( $>2$ ) and suggests a manipulation failure.

### 2.2 | Procedures

Participants were told that they were participating in a study constituted by several unrelated tasks. They were first given a booklet containing individual differences measures that were administered for explorative purposes. Subsequently, the scenarios used to manipulate deontological and altruistic guilt were administered, followed by visual analog scales designed to assess emotions and check the manipulation. Lastly, participants were asked to sit in front of a personal computer where they took part in the visual search task developed by Toffolo et al. (2013).

### 2.3 | Manipulation of guilt

In each condition, participants had to carefully read two different scenarios trying to identify to the best of their ability with the protagonist. Scenarios were previously validated and used for the same purposes by D'Olimpio and Mancini (2014; see also Ottaviani, Collazzoni, D'Olimpio, Moretta, & Mancini, 2018) and are reported in Appendix A. More specifically, in the altruistic guilt condition, one scenario described a waiter that was not able to help a less experienced waiter, which was eventually fired. The other scenario described war circumstances in which a doctor had to choose which of the two seriously wounded colleagues to treat. The one that was not immediately treated eventually died.

In the deontological guilt condition, the first scenario described a person who cheated to pass an exam and was still feeling guilty after months. In the second vignette, participants were asked to identify with a person who lied about a car accident, denying his own personal responsibilities.

### 2.4 | Visual search task and manipulation of uncertainty

We used the same task and stimuli previously used by Toffolo et al. (2013; see also Toffolo et al., 2014). More specifically, the task consisted of 50 trials. Each trial was composed by a series of 25 squares, which could include or not a completely closed one. Participants were instructed to carefully examine each trial and to establish as quickly and accurately as possible whether the full square was present or not. We recorded latency and accuracy of answer for each trial. Following other tasks that are based on response latencies (Greenwald, Nosek, & Banaji, 2003), we aggregated latencies on correct trials to obtain an average response time on absent trials and an average response time on present trials. These two scores were used as focal dependent variables.

In the target present trials, which are designed to induce low levels of uncertainty about the performance, 24 squares were opened, whereas one square—the critical target—was fully closed. In the target absent trials, which are designed to induce high levels of uncertainty about the performance, all the 25 squares were partially opened on one side.

### 2.5 | Manipulation checks

Following D'Olimpio and Mancini (2014), to check the adequacy of the guilt induction, after reading each scenario, participants were asked to use visual analog scales from 0 (*not at all*) to 100 (*very much so*), to report the following emotions: happiness, shame, fear, sadness, disgust, altruistic guilt, deontological guilt, anger, and pity. Each item included a definition and several features for that specific emotion. The scale is reported in Appendix A.

Perception of uncertainty was checked by asking participants to express their agreement with the following sentence after each trial

of the visual search task: "I feel uncertain about my response in this trial." Participants used a 7-point scale (1 = *not at all*; 7 = *very much so*), and average scores for absent and present trials were calculated. Our measure about the manipulation check of the perception of uncertainty was quite different from the manipulation check used by Toffolo et al. (2013). The original measure would require participants to respond retrospectively and only once, at the end of the whole task, how they felt when presented with a type of trial rather than the other. Our choice to repeat the question at the end of each trial was driven by the will to have a more precise measure, although we are aware about the risk that such a choice might have increased the awareness of participants' uncertainty

### 3 | RESULTS

The data that support the findings of this study are available from the corresponding author upon reasonable request.

#### 3.1 | Manipulation checks of guilt and emotions

We particularly focused on the visual analog scale assessing deontological and altruistic guilt. We performed a repeated measure analysis of variance (ANOVA) with guilt manipulation (deontological vs. altruistic) as between-subjects factor and reported guilt (deontological and altruistic) as within-subjects factor. The analysis showed that, overall, altruistic guilt ( $M = 41.53$ ,  $SD = 17.19$ ) was more intense than deontological guilt ( $M = 32.21$ ,  $SD = 18.73$ ),  $F(1, 98) = 32.86$ ,  $p < .001$ ,  $\eta_p^2 = .25$ . More importantly, a significant two-way interaction between guilt induction and self-reported guilt emerged,  $F(1, 98) = 123.79$ ,  $p < .001$ ,  $\eta_p^2 = .56$ . As desired, inspection of the means showed that scores of altruistic guilt were higher ( $M = 50.46$ ,  $SD = 13.17$ ) when altruistic rather than deontological guilt was induced ( $M = 32.61$ ,  $SD = 16.15$ ),  $F(1, 98) = 36.68$ ,  $p < .001$ ,  $\eta_p^2 = .27$ . The opposite was found for deontological guilt, which was more pronounced under deontological ( $M = 41.38$ ,  $SD = 15.43$ ) rather than altruistic guilt induction ( $M = 23.05$ ,  $SD = 17.30$ ),  $F(1, 98) = 31.26$ ,  $p < .001$ ,  $\eta_p^2 = .24$ . This pattern of results indicates that our manipulation was successful.

We also conducted a series on one-way ANOVAs to test the effect of the manipulation on the other emotions that were measured. The analyses showed that under altruistic rather than deontological condition, participants reported more sadness ( $M = 34.96$ ,  $SD = 12.58$  vs.  $M = 26.36$ ,  $SD = 14.37$ ,  $F(1, 98) = 10.14$ ,  $p = .002$ ,  $\eta_p^2 = .09$ ) and pity ( $M = 46.21$ ,  $SD = 16.40$  vs.  $M = 31.92$ ,  $SD = 13.41$ ,  $F(1, 98) = 22.75$ ,  $p < .001$ ,  $\eta_p^2 = .19$ ), and less fear ( $M = 19.09$ ,  $SD = 14.64$  vs.  $M = 29.88$ ,  $SD = 15.25$ ,  $F(1, 98) = 13.03$ ,  $p < .001$ ,  $\eta_p^2 = .12$ ) and happiness ( $M = 2.30$ ,  $SD = 4.36$  vs.  $M = 11.46$ ,  $SD = 11.43$ ,  $F(1, 98) = 28.01$ ,  $p < .001$ ,  $\eta_p^2 = .22$ ). A trend emerged on anger with participants under deontological guilt reporting less anger ( $M = 13.70$ ,  $SD = 13.16$ ) than those under altruistic guilt ( $M = 17.50$ ,  $SD = 13.36$ ). This difference was however not significant,  $F(1, 98) = 2.05$ ,  $p = .15$ ,  $\eta_p^2 = .02$ . Also, no difference between conditions emerged on disgust ( $F < 1$ ). This pattern of

results overlaps with the findings obtained in previous studies (D'Olimpio & Mancini, 2014).

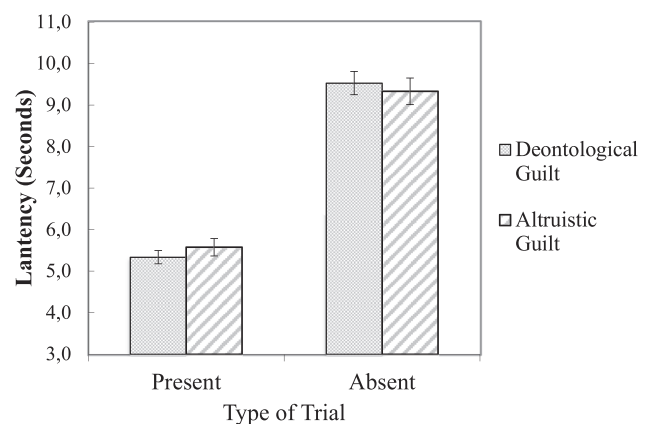
#### 3.2 | Manipulation checks of uncertainty

A 2 (deontological vs. altruistic guilt)  $\times$  2 (uncertainty on present vs. absent trials) mixed ANOVA with the last factor within subjects was conducted to check whether absent trials solicited more feeling of uncertainty when responding than present trials. As expected, we found higher ratings of uncertainty on absent trials ( $M = 2.12$ ,  $SD = 1.76$ ) rather than on present trials ( $M = 1.92$ ,  $SD = 1.89$ ),  $F(1, 98) = 7.15$ ,  $p = .01$ ,  $\eta_p^2 = .07$ . The two-way interaction with manipulation of guilt was not significant,  $F(1, 98) = .80$ ,  $p = .37$ ,  $\eta_p^2 = .01$ . Thus, we conclude that the manipulation was successful.

#### 3.3 | Visual scan latency

The latency was analyzed by means of a 2 (deontological vs. altruistic guilt)  $\times$  2 (uncertainty on present vs. absent trials) mixed ANOVA with the last factor within subjects. Given that our manipulation affected several different emotions, and because we are mainly interested in knowing the unique impact of the two types of guilt manipulated, we entered in the model all the other emotions measured after the manipulation as covariates.

The analysis yielded a significant effect of the type of trial,  $F(1, 91) = 55.19$ ,  $p < .001$ ,  $\eta_p^2 = .38$ . Consistent with Toffolo et al. (2013), participants spent more time scanning the absent ( $M = 9431$ ,  $SD = 2119$ ) rather than present trials ( $M = 5458$ ,  $SD = 1307$ ). More interestingly for the purposes of the present work, this effect was qualified by a two-way interaction with the type of manipulated guilt,  $F(1, 91) = 3.87$ ,  $p = .052$ ,  $\eta_p^2 = .04$ , although the expected two-way interaction only approached conventional level of significance. As can be noted in Figure 1, within the deontological guilt condition, participants checked the absent trials for a longer time ( $M = 9,531$ ,  $SD = 1,971$ , 95% CI [8,971, 10,091]) than the present trials ( $M = 5,339$ ,  $SD = 1,102$ , 95% CI [5,025, 5,652]),  $F(1, 42) = 18.27$ ,  $p < .001$ ,  $\eta_p^2 = .30$ .



**FIGURE 1** Latency of visual scan as a function of type of trial and guilt manipulation

Again, in the altruistic guilt condition, absent trials were scanned longer ( $M = 9,332$ ,  $SD = 2,274$ , 95% CI [8,685, 9,978]) than present trials ( $M = 5,578$ ,  $SD = 1,485$ , 95% CI [5,155, 6,000]),  $F(1, 42) = 24.10$ ,  $p < .001$ ,  $\eta_p^2 = .36$ . In general, the overall pattern was similar in the two conditions, but the difference between present and absent trials was less pronounced in the altruist rather than the deontological guilt condition.

To clarify further the findings, we also performed simple effect analysis within the experimental conditions by conducting two separate one-way ANOVAs on the latencies of absent and present trials while controlling for emotions and the other types of latency. When latency on absent trials was used as a dependent variable, participants in the deontological condition employed more time ( $M = 9,531$ ,  $SD = 1,971$ ) than participants in the altruistic condition ( $M = 9,332$ ,  $SD = 2,274$ ),  $F(1, 90) = 4.60$ ,  $p = .035$ ,  $\eta_p^2 = .05$ . In contrast, when latency on present trials was considered, the opposite pattern emerged (deontological guilt:  $M = 5339$ ,  $SD = 1102$  vs. altruistic guilt:  $M = 5578$ ,  $SD = 1485$ ),  $F(1, 90) = 4.47$ ,  $p = .037$ ,  $\eta_p^2 = .05$ .

## 4 | GENERAL DISCUSSION AND CONCLUSIONS

Consistent with previous works (Toffolo et al., 2013, 2014), the present research showed that when the target was absent (vs. present) participants felt more uncertain and spent more time searching for the square (i.e., checking behavior). Although both the induced guilt scores were not very high, however, as hypothesized, the difference between absent and present trials was more consistent when participants experienced deontological rather than altruistic guilt. It should be noted that this finding emerged despite scores of both altruistic and deontological guilt were below scale midpoint in both conditions. Because we used a scenario-based manipulation, these relatively low scores were predictable, and they are indeed consistent with studies conducted with similar methodologies (Mancini & Gangemi, 2015). In addition, our goal was not to induce absolute high levels of guilt but rather to increase relative levels of deontological versus altruistic guilt in the two conditions. Manipulation check measures confirmed that we were successful in this respect, showing that our manipulation was effective.

It should be acknowledged that scan latency time in our study was in general longer than those emerged in the work from Toffolo et al. (2013). Because the procedure was very similar, we think that the two main variations that might explain this difference are the inductions of guilt (both altruistic and deontological), which might encourage scrupulosity and the type of population involved (Italian, first-year undergraduate student). Despite these differences, the main pattern of results closely resembles the one obtained by Toffolo and colleagues in which obsessive-compulsive tendencies moderated the effect of uncertainty embedded in the trials on checking. Here, however, we did not consider individual differences in obsessive tendencies but rather we manipulated guilt (deontological vs. altruistic).

In doing so, we drew attention on an important underlying mechanism that is suitable to explain why uncertainty increased checking

especially for individuals with OCD. More specifically, we proposed that uncertainty undermines confidence in the conclusion that a norm has not been violated. This type of conclusion serves a central goal for individuals experiencing deontological guilt: avoiding further deontological guilt originating from rule violations and making mistakes. This goal, which also characterizes OCD psychopathological functioning (Mancini & Gangemi, 2015), is difficult to achieve because it is often framed in terms of “absence of violations,” rather than “presence of virtuous behavior.” If, for any reasons, other sources of uncertainty are present in the situation, the goal of excluding violations become increasingly difficult and consequently checking behavior increases. This, obviously, is less intense when the goal of excluding further guilt for rule violation is not present, as in the condition of altruistic guilt.

Analyses also showed an unexpected finding. When the target was present, participants spent less time checking when they experienced deontological, rather than altruistic guilt. We think that this finding, although not predicted, is not inconsistent with our line of reasoning. It should be indeed considered that participants were asked to respond both accurately and quickly. In other words, participants were asked to respect two specific instructions: do not commit errors and to be as quick as possible in the answers. When the target was present, it was relatively easy to be accurate and to exclude error commission; thus, participants attempted to be also quick in their responding as requested. This was especially true for those under deontological guilt, that is, participants particularly concerned with respecting rules and avoiding further deontological guilt. Obviously, such a speculative explanation should be more supported by further empirical studies.

There is a long-standing research tradition in psychology and social sciences on the effects of uncertainty. Different types of uncertainty have been distinguished and considered such as informational uncertainty, outcome uncertainty, personal uncertainty, and environmental uncertainty (Kahneman & Tversky, 1982; Milliken, 1987; Van den Bos & Lind, 2013). If our reasoning holds, not all types of uncertainty should affect individuals who seek to avoid deontological guilt. For example, uncertainty about the outcome (e.g., will I get  $x$  or  $y$ ?) should not be very relevant in pursuing the guilt aversion goal. In contrast, uncertainty about the self (e.g., what is my view about a certain issue?) or informational uncertainty (e.g., do I have all information to make a decision?) could be much more influential in excluding the violations. It is possible to speculate that the source of uncertainty affecting the procedure through which a decision is made is more likely to interfere with avoiding deontological guilt. This, however, should be investigated by future research.

Present findings also stress the importance of distinguishing between different types of guilt when considering psychopathological mechanisms underlying OCD. Although the idea that guilt may play a role in the genesis of OCD is not new (see, e.g., Rachman, 1993; Shafran et al., 1996), the focus on deontological guilt offers a more fine-grained perspective that might help in predicting what are the potential risk factors, as well as the more suitable treatments. Specifically, our results contribute to give support to the thesis that at the base of underlying, the OCD symptomatology could be a “fear of being guilty” in a deontological and not altruistic sense. Indeed,

individuals with OCD are often obsessed with thoughts that in no way imply damage to anyone (i.e., thoughts of being perverse or blasphemous people). Thus, addressing concern for deontological guilt, reducing the sense of deontological responsibility, for example, by training OCD patients to tolerate this specific emotional state and by encouraging them to disengage from the goal of avoiding deontological guilt, might contribute to reduce the compulsive symptomatology such as the checking behaviors (Mancini & Barcaccia, 2014).

The main limitation of the present work resides in the strength of the findings. The two-way interaction that tests the key hypothesis of the study is on the edge of significance ( $p = .052$ ). This might lead to the conclusion that results are not robust. It should be noted, however, that we conducted a particularly conservative test of our hypothesis and stronger results would have been implausible. Indeed, the two experimental groups only differed in the type of guilt they experienced. In this regard, several scholars encourage to interpret statistical measures as continuous parameters, rather than using rigid cutoff values to decide on the relevance of the effects (Amrhein, Greenland, & McShane, 2019). This approach might be particularly reasonable considering the dependence of the statistical significance on the sample size (Sullivan & Feinn, 2012) and the natural fluctuation of effect sizes (Kenny & Judd, 2019). Thus, we recognize that the present results need to be cautiously interpreted, but discarding these effects only on the basis of a modest  $p$  value would have obscured potentially important processes from view.

Although, as specified earlier, deontological and altruistic guilt are distinct instances of guilt, they share several qualities such as valence and some behavioral tendencies. Thus, the impact of the manipulation used is rather attenuated. More importantly, the potential rule violation that was present in the task had little or no moral implications. Deontological guilt, especially when related to OCD, is strongly connected to rule violations that negatively impact the moral status of the person. In the present case, the only rule that was assigned was to detect the target and, probably, the violation of such rule confers minimal harm to one's own moral status. Despite that, we still find a pattern that is highly consistent with our hypotheses that are derived in a rather straight fashion from previous works (D'Olimpio & Mancini, 2014; Mancini & Gangemi, 2004). Although we considered this issue when designing the study, we preferred to stick to the original methodology used by Toffolo et al. (2013) to increase comparability of findings. However, this task, or other tasks, could be easily modified to increase moral consequences of rule violations. In such cases, we would expect stronger effects. In conclusion, the present work helps to shed light on the mechanisms underpinning the association between uncertainty and checking behavior. At the same time, and more importantly in our opinion, it puts a strong emphasis on how important it is to consider the preponderant motivational orientation (i.e., avoiding deontological guilt) to better understand OCD and how contextual variables, such as uncertainty, might affect it.

## CONFLICT OF INTEREST

No competing financial interests exist.

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## ETHICAL APPROVAL

All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. This article does not refer to any studies with animals performed by any of the authors.

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## Appendix A.

### Induction of deontological sense of guilt

Now you will be presented with two stories, read them carefully, trying to imagine that you are really in the situation described.

#### Scenario #1

Mara was the best girl in the class, the most willing. She had always been clear about her goals, including getting out of high school with full marks. So, it happened that in the last year of high school, Mara studied so much, committed herself to the maximum, sacrificed so much free time to devote herself to her studies, sacrificed so many friendships that she set aside that year. In short, she worked really hard, but it happened that despite her efforts at the end of the year, the recommended ones on duty had a higher average than her, and she risked losing an important scholarship that would have allowed her to enter a prestigious university. And then thinking of her great dream that broke, she resorted to a not very clean stratagem: she stole the results of the test of the exam! After several months, when the

exam was far away and she graduated with the highest grade, she began to feel guilty and resent about what she had done. But she no longer knew how to act, nor who to turn to, the weight of guilt was now very strong, like her desire to confess and free herself from that guilt. All she did was think "Oh God, what I did," but meanwhile time passed and she couldn't find a solution.

### Scenario #2

Once I felt that I had transgressed the moral norms it was when one day I secretly took my father's car to visit a friend, even though I was strictly forbidden. I parked the car in the street and on my return, I found a broken mirror. Once back home I put the car down and without saying anything I went to my room. The next day, when my father noticed the damage, he was very angry with me, but I denied everything, suggesting that the culprit could be our next-door neighbor who, absent-mindedly, returning from work, could have hit the mirror of our car with his own car. Fortunately, there were no repercussions on our neighbor, but after saying that lie I felt very guilty and several times I thought I would confess that it was me, also because my lie had also involved another person, but thinking about the consequences I never had the courage. So far, for my father, our distracted neighbor remains the only culprit of that little disaster.

### Induction of altruistic sense of guilt

Now you will be presented with two stories, read them carefully, trying to imagine that you are really in the situation described.

#### Scenario #1

About 1 year ago, I started working as a waiter in a pizzeria on Saturday and Sunday nights. Last summer he a new guy came to work in this pizzeria. I already knew him and I didn't like him at all. The owner of the pizzeria told all of us "old waiters" to show Antonio (the new guy) what to do and how to do it. Antonio made a mistake and some confusion with the tables and he came to me to ask for help; I messed up with work and maybe because I didn't feel much sympathy for him, I pretended nothing. In the evening, when we were leaving, the owner told Antonio that he had not gone well and that he did not need him. In short, Antonio was fired. I had not pretended to do nothing to send him away and see instead that it was my fault that it had ended so he made me think: "Poor man, I could have helped him, I had the chance to do it."

#### Scenario #2

Afghanistan 2002. It is a hot afternoon when two volunteers rest under a very desirable tent. The scenario that lies ahead is quite gruesome: mutilated bodies, torn apart, left to die in the sun, the needy are many and the people involved in doing so are few. The calm under the tent does not last long, a new deafening noise awakens the two volunteers with a start, it is not a dream but reality: it is a new bomb. The

two volunteers meet in a cross-eyed look witness to the harsh reality. They come out of the tent with a start, find a tent near them struck by a scrum, make sure of their colleagues' health and see two people needing imminent care, they must be operated but they can only help one. Now they have to choose which of the two to help: they choose to help the younger colleague, a recent graduate who wanted to try this new life experience. So, they are going to operate him by stitching up the various wounds in the shortest possible time, hoping to be able to arrive in time to be able to help even the other colleague left on the field under the tent. They manage to heal the wounds of the first colleague in the best way and without wasting even a minute they run to check the health of the other injured colleague. It is too late, the deep wounds have prevailed, and now it rests in peace. But a feeling of anger and despair hits the two volunteers, if we had been readier, only if we had been faster, maybe we could have saved him. If only...

### VAS

Evaluate how much you are currently experiencing each of the following emotions by putting a bar at the point on the scale that you feel is most appropriate. Refer to the emotional state you are feeling now.

1. Shame, feeling of discomfort and redness in the face, desire to get under the brick, to make oneself small and disappear; "What a figure I made!"

Not at all 0 \_\_\_\_\_ 100  
Very much so

2. Sadness, depression, emptiness, loss and/or failure, hopelessness; want to cry or do nothing; "there's nothing left to do"

Not at all 0 \_\_\_\_\_ 100  
Very much so

3. Fear, apprehension accompanied by tachycardia, breathlessness, tremors, desire to escape, escape or have help and protection; "Help! What will happen now?"

Not at all 0 \_\_\_\_\_ 100  
Very much so

4. Disgust, feeling of being contaminated, feeling of nausea, stomach pain, repulsion; want to wash, cleanse; "how disgusting!"

Not at all 0 \_\_\_\_\_ 100  
Very much so

5. Anger, activation, desire to scream, attack, break, beat; "How was it allowed?!!"

Not at all 0 \_\_\_\_\_ 100  
Very much so



6. Pity, sorrow, compassion for the other who suffers or is undeservedly damaged, a desire to help and console him or stay close to him; "Poor you, what a mess"

Not at all 0 ..... 100  
Very much so

7. A sense of altruistic guilt, regret and remorse for the undeserved suffering or harm of another person, accompanied by the awareness of not having wanted or been able to help him; desire to sacrifice to help or comfort him; "Poor him/her, I could have helped him/her, I had the chance to do it!"

Not at all 0 ..... 100  
Very much so

8. Sense of deontological guilt, feeling of having transgressed moral norms accompanied by remorse; repentance and desire, but sometimes fear, to confess, ask forgiveness and do penance; "Oh God! What did I do! How I allowed myself!"

Not at all 0 ..... 100  
Very much so

9. Happiness, internal satisfaction, pleasure; desire to undertake new activities; "Yeah !!! How beautiful!!!"

Not at all 0 ..... 100  
Very much so