

Inferential confusion and obsessive-compulsive tendencies are positively associated to deontological guilt and negatively associated to altruistic guilt propensity

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Abstract

The inferential confusion hypothesis posits that obsessive doubt stems from inferential reasoning, in which the individual neglects sensory input, favoring subjective possibilities. Recent data have shown that individuals with obsessive compulsive disorder (OCD) favor imagined possibilities only when they correspond to threatening information, assuming a hyper-prudential attitude. A major threat for OC patients is represented by deontological guilt (and not altruistic guilt), however, no studies investigated the effects of the propensity to experience different types of guilt on Inferential Confusion. Here we hypothesize that an increased inclination towards deontological guilt (vs. altruistic guilt), is associated with a greater tendency to experience inferential confusion in a non-clinical population. 159 subclinical Italian-speaking participants completed the *Inferential Confusion Questionnaire–Expanded Version* along with the Moral Orientation Guilt Scale (MOGS) and the *Obsessive-Compulsive Inventory-Revised*. Data were analyzed using multiple regression models. Results show that higher levels of deontological guilt propensity, specifically of Moral Dirtiness were positively associated to greater self-reported inferential confusion and obsessive-compulsive tendencies. Crucially, altruistic guilt levels were negatively associated to inferential reasoning and OC symptoms. In conclusion, data underscore the importance of addressing deontological guilt propensity in treating OCD.

1. Introduction

Obsessive-Compulsive Disorder (OCD) is characterized by obsessions and compulsions. Obsessions are recurring, intrusive thoughts or images causing significant psychological distress, while compulsions are repetitive actions or mental exercises performed in response to obsessions, often following strict routines. A key aspect of OCD is scrupulosity, where doubt persists even after certainty is achieved (Mancini, 2018). Historically, the disorder was termed the "disease of doubt" (Raymond & Janet, 1903). Extensive research has explored the psychological mechanisms behind obsessive doubt. Some researchers (Muller & Roberts, 2005) suggest that obsessive doubt may result from cognitive deficits in areas like memory and attention. However, studies have shown that individuals with OCD generally perform well on memory-related tasks but lack confidence in their memory abilities compared to controls (Brown et al., 1994; Constans et al., 1995; Cogle et al., 2007; Dar, 2004; Dar et al., 2000; Tolin et al., 2001). OCD patients also exhibit low confidence in decision-making, concentration, and attentiveness (Nedeljkovic et al., 2009; Nedeljkovic & Kyrios, 2007; Aardema et al., 2006; van den Hout et al., 2009, 2008; Hermans et al., 2003, 2008). This lack of confidence is exacerbated by compulsive behaviors, leading to a vicious cycle that maintains obsessive doubt (Ashbaugh & Radomsky, 2007; van den Hout et al., 2009; van den Hout & Kindt, 2003, 2004). The persistence of doubt, even when faced with objective and reassuring information, remains inadequately understood in OCD patients.

1.1. OCD and Inferential Confusion

Some scholars argue that obsessive doubt results from inferential reasoning, leading OCD individuals to mistrust sensory data (Aardema & O'Connor, 2003). For instance, an individual might observe a closed

gas tap but continue to doubt it due to the possibility that it may still be open (e.g., perhaps it didn't close completely). Thus, individuals with OCD may prefer hypothetical or subjective information over sensory data, a condition termed Inferential Confusion, which perpetuates obsessive doubt by lending credibility to hypotheses that contradict reality. In contrast, the cognitive-behavioral perspective attributes OCD to cognitive appraisal, where an individual's goals (desires, needs, values) and beliefs (thoughts, representations, assumptions) are proximal determinants of obsessive doubt and compulsions. Compulsions serve as strategies to neutralize perceived threats from obsessions (Mancini, 2018). However, the Inference-Based Approach proposes that while threat protection is common in anxiety-related disorders, Inferential Confusion is the specific process driving obsessive doubt and compulsions in OCD (Aardema et al., 2006, 2008). Experimental studies using the Inference Process Task have shown that OCD individuals, like controls, treat reality information similarly but are more swayed by hypothetical information when evaluating OCD-relevant threats, displaying higher levels of obsessive doubt and compulsion urgency (Aardema et al., 2009; Jaeger et al., 2015; Nikodijevic et al., 2015). However, a recent review of past studies suggests that in the Inference Process Task, hypothetical information related to OCD symptoms always aligns with danger hypotheses, while reality information aligns with reassuring data. Using a modified Inference Process Task, researchers found that individuals experience greater obsessive doubt and compulsion urgency when presented with danger-information statements, regardless of whether they are hypothetical or reality-based (Gangemi et al., 2015). This research supports a prudential reasoning hypothesis, positing that Inferential Confusion stems from a "better safe than sorry" approach in threatening contexts. Prudential reasoning involves focusing on worst-case scenarios and seeking confirmation of danger hypotheses while disregarding safety hypotheses (Johnson-Laird et al., 2006; Mancini et al., 2007; Mancini & Gangemi, 2004). But what constitutes the "danger" or "threat" that triggers prudential reasoning and Inferential Confusion? This study tests the hypothesis that inferential confusion correlates with deontological guilt, a form of guilt that jeopardizes an individual's moral standing.

1.2. Guilt feelings and psychopathology

Guilt is not a singular concept. Different guilt types can be described based on individual moral orientation. According to this perspective, guilt can arise from the deontological or altruistic moral domains. Deontological guilt (DG) necessitates and suffices the violation of an internal moral norm, while altruistic guilt (AG) arises from failing an altruistic goal and involves a victim, even if no moral norm is breached (Mancini & Gangemi, 2021).

Numerous studies indicate that the most significant threat for OCD individuals is related to responsibility and deontological guilt (Arntz et al., 2007; Mancini & Gangemi, 2004, 2011; Niler & Beck, 1989; Rachman, 1993; Salkovskis et al., 2000). A review highlights the heightened sensitivity to DG among OCD patients compared to controls (Gangemi & Mancini, 2017). In one study, obsessive patients resolved the "trolley dilemma" by avoiding DG, while individuals with other anxiety disorders avoided AG (Mancini & Gangemi, 2014). Another study revealed that psychiatric patients performed more checks when experiencing DG in uncertain conditions compared to AG (Giacomantonio et al., 2019). Furthermore, OCD individuals exhibit

a pronounced "Lady Macbeth effect," greater than in controls (Reuven et al., 2014). During obsessive symptom activation, OCD patients show activation in brain areas similar to healthy individuals when experiencing DG (Basile et al., 2011), but less activation compared to controls, suggesting more frequent experiences of DG (Basile et al., 2014) in line with the neural efficiency hypothesis (Neubauer and Fink, 2009).

The Moral Orientation Guilt Scale (MOGS) is the first empirical tool to measure guilt types based on moral orientation and consists of 17 items (Mancini et al., 2022a). The MOGS identifies four guilt types: Moral Norm Violation (MNV), representing the fear of offending authority and preventing guilt through moral conformity; Moral Dirtiness (MODI), indicating the tendency to feel morally degraded and experience moral disgust towards oneself; Empathy guilt, reflecting guilt for others' misfortunes in light of personal good fortune; and Harm guilt, representing the tendency to feel and prevent guilt from harming others and comforting victims.

The current Study

Emerging evidence highlights the critical role of deontological guilt in OCD's development and persistence (Mancini and Gangemi, 2021). Notably, OCD patients score higher on the MOGS's deontological guilt scales (Moral Norm Violation and Moral Dirtiness) compared to non-OCD individuals. Additionally, a positive linear relationship between MNV guilt and OCD symptom severity has been observed in OCD patients but not in anxious or depressed individuals (Mancini et al., 2022b). However, the role of various guilt types in predicting inferential confusion has not been explored. This study investigates the link between different guilt types and i) OCD symptoms and ii) inferential confusion in a subclinical sample. We propose that a higher tendency to experience deontological guilt and feeling morally degraded will correlate with increased distrust of the senses, inverse inference, and pronounced OCD symptoms. Conversely, a higher tendency towards altruistic guilt will correlate with reduced inferential confusion and OCD symptoms.

2. Methods

2.1. Participants

A power analysis using G*Power 3.1 (Erdfelder et al., 2009) estimated the sample size, assuming a p level of .05, a low effect size (0.12), and a power of 0.80. The analysis indicated that 127 participants were needed for an 80% chance of correctly rejecting the null hypothesis. We initially recruited 195 participants, excluding 36 due to psychiatric diagnoses (other than OCD), unrealistic completion times (under 15 minutes), or incomplete responses. The final sample included 159 Italian participants (48.4% female), aged 19 to 64, with a mean age of 26.4 (SD = 7.58) and average education of 18.4 years (SD = 2.98). The sample consisted of 17% students, 55% employed, 11% self-employed, 3% retired, and 14% unemployed. Educational levels included 52% with a three-year degree, 11% with a master's degree, 26% with a high school diploma, 1% with a PhD, and 2% with a postgraduate master's. Participants were

unaware of the study's hypothesis and were recruited via the Prolific platform, receiving compensation (rate 7 euro/h). The study adhered to the Declaration of Helsinki's principles and received approval from the School of Cognitive Psychotherapy's ethical committee in Rome, Italy.

2.2. Materials and procedure

Participants accessed an online survey hosted by QuestionPro®, detailing the study, consent form, eligibility questions, sociodemographic information (age, gender, education level), and questionnaires (discussed below). Survey completion took approximately 30 minutes.

2.3. Measures

Inferential Confusion Questionnaire–Expanded Version (ICQ–EV; Aardema et al., 2010): This 30-item questionnaire assesses two inferential confusion aspects: sensory distrust and inverse inference, using a 5-point Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"). The ICQ-EV has demonstrated good construct validity, acceptable item-total correlation ($\alpha_{\text{Total}} = 0.69$), and good test-retest reliability ($r = 0.90$).

Obsessive-Compulsive Inventory–12 (OCI–12; Abramovitch et al., 2021): This 12-item questionnaire evaluates OCD symptoms (washing, checking, ordering, obsessing) using a 5-point Likert scale from 0 ("not at all") to 4 ("extremely"). The OCI-12, excluding hoarding and neutralizing subscales, exhibits good psychometric properties with reliability indexes ($\alpha = 0.71$ to $\alpha = 0.89$) across non-clinical, anxiety-related, and OCD subjects. It also shows superior sensitivity and specificity for OCD.

Moral Orientation Guilt Scale (MOGS; Mancini et al., 2022): This 17-item measure evaluates guilt propensities by moral orientation, identifying four factors: Moral Norm Violation (MNV), Moral Dirtiness (MODI), Empathy, and Harm. The MOGS demonstrates good construct validity and acceptable reliability ($\alpha_{\text{MNV}} = 0.82$; $\alpha_{\text{Harm}} = 0.81$; $\alpha_{\text{Empathy}} = 0.82$; $\alpha_{\text{MODI}} = 0.70$; $\alpha_{\text{Total}} = 0.87$).

2.4. Statistical analyses

Descriptive statistics were computed, and preliminary analyses were conducted on all measures. A correlation matrix was analyzed with Bonferroni correction. To address the study's aims, two multiple regression models were performed, using the four guilt types (MNV, MODI, Empathy, Harm) as independent variables, and OCI symptom severity (OCI-R scores) and inferential confusion tendency (ICQ scores) as dependent variables. The determination index R^2 indicated model fit. Statistical analyses were conducted using Jamovi software (Version 2.3; The Jamovi Project, 2023).

3. Results

3.1. Descriptive Statistics and preliminary analyses

Table 1 presents the correlation matrix and descriptive statistics (mean, standard deviation) of all variables. All variables, except MNV, deviated significantly from normality (Shapiro–Wilks's $p < .05$; MNV

$p=.08$). However, asymmetry and kurtosis values did not exceed critical thresholds (West et al., 1995), allowing all variables for statistical analysis. Regression diagnostics (variance inflation factor, tolerance) indicated no multicollinearity issues. Significant correlations emerged between OCI scores and MODI scores ($r = 0.54, p < .001$) and ICQ scores ($r = 0.68, p < .001$). MODI scores also correlated significantly with ICQ scores ($r = 0.51, p < .001$). No predictor correlation coefficients exceeded 0.7, confirming no multicollinearity. No variance inflation factor exceeded 4.0, and no tolerance value was less than 0.2, affirming no multicollinearity problems (Hair et al., 2010). In the sample, 62.73% scored above the OCI-12 cutoff (>11).

	1	2	3	4	5	6	M	SD
1. MNV	-						17.6	4.95
2. MODI	0.258**	-					8.26	2.95
3. Empathy	0.224**	0.40***	-				16.2	4.54
4. Harm	0.247**	0.33***	0.53***	-			12.7	2.27
5. ICQ EV	0.048	0.52***	0.20*	-0.049	-		87.4	36.4
6. OCI-12	0.030	0.51***	0.04	-0.031	0.63***	-	15.9	9.52

Table 1. Means, Standard Deviations and Correlations Between Variables. *Note.* Standardized Beta coefficient and Standard Errors and Significance Levels for Predictors of the OCI-R = Obsessive Compulsive Inventory Revised. *Note.* MNV= Moral Norm Violation Guilt; MODI= Moral Dirtiness; Empathy = Empathy guilt; Harm= Harm guilt. * $p<.05$. ** $p<.01$. *** $p<.001$.

3.2. Linear regressions

3.2.1. OCI-12

We performed the first linear regression model (Table 2) by considering the propensity to different types of guilt as independent predictors of the OC symptomatology, which was entered in the analysis as outcome. The set of predictors globally explained 31% of the outcome's variance. Significant results were found for the positive effects of Moral Dirtiness guilt ($\beta = 0.62, p < .000$) and the negative effect of Harm guilt ($\beta = -0.17, p = .032$). We observed that the higher the propensity to feel dirty and degraded when feeling guilty, the greater the severity of OCD symptoms. Conversely, the greater the propensity to feel guilty for having caused a harm to another, the lower the severity of OCD symptoms. All other associations were not significant.

	β	SE	t	p	R2	Adj. R2
MNV	-0.06	0.13	-0.95	0.34	0.31	0.30
MODI	0.62	0.24	8.36	<.001***		
Empathy	-0.09	0.17	-1.14	0.25		
Harm	-0.17	0.33	-2.16	0.032 *		

Table 2. Standardized Beta coefficient and Standard Errors and Significance Levels for Predictors of the OCI-R = Obsessive Compulsive Inventory Revised. Note. Adj. = adjusted; MNV= Moral Norm Violation Guilt; MODI= Moral Dirtiness; Empathy = Empathy guilt; Harm= Harm guilt. * $p < .05$. ** $p < .01$. *** $p < .001$.

3.2.2. ICQ

We performed the second linear regression model (Table 3) by considering the propensity to different types of guilt as independent predictors of the Inferential Confusion scores, which was entered in the analysis as outcome. The set of predictors globally explained 34% of the outcome's variance. Significant results were found for the positive effects of Moral Dirtiness guilt ($\beta = 0.57, p < .001$) and the negative effect of Harm guilt ($\beta = -0.30, p < .001$). We observed that the higher the propensity to feel dirty and degraded when feeling guilty, the greater the tendency to experience Inferential Confusion. Conversely, the greater the propensity to feel guilty for having caused a harm to another, the lower the tendency to experience Inferential Confusion. All other associations were not significant.

	β	SE	t	p	R2	Adj. R2
MNV	-0.43	0.50	-0.85	0.39	0.58	0.34
MODI	0.57	0.90	7.88	<.001***		
Empathy	0.14	0.64	1.84	0.068		
Harm	-0.30	1.2	-3.90	<.001***		

Table 3. Standardized Beta coefficient and Standard Errors and Significance Levels for Predictors of the ICQ EV = Inferential Confusion Questionnaire Expanded Version. Note. Adj. = adjusted; MNV= Moral Norm Violation Guilt; MODI= Moral Dirtiness; Empathy = Empathy guilt; Harm= Harm guilt. * $p < .05$. ** $p < .01$. *** $p < .001$.

4. Discussion

To date no studies have investigated the effects of the propensity to experience different types of guilt on Inferential Confusion. Findings reveal that a tendency towards deontological guilt, specifically feeling morally degraded when guilty, correlates with increased obsessive symptoms and sensory distrust. In contrast altruistic guilt propensity, is linked to lower obsessive symptomatology and to a lower tendency

to distrust the senses. As previously mentioned, several authors agree on distinguishing different types of guilt, altruistic and deontological, asserting that the latter plays a crucial role in obsessive symptomatology (Gangemi and Mancini, 2017; Mancini and Gangemi, 2021). Previous literature has shown the particular sensitivity of obsessive patients to deontological guilt and its role in symptom determination (Shapiro and Stewart, 2011; Mancini, 2018). Specifically, in a previous study, OC patients have shown higher Moral Dirtiness scores and Moral Norm Violation scores with respect to controls (Mancini et al., 2022b) and a linear association between MNV guilt and disgust (Mancini et al., 2022). Moreover, studies have shown that inducing deontological guilt leads to behaviour resembling obsessive tendencies even in non-clinical subjects (D'Olimpio and Mancini, 2014). Thus, the increased tendency to distrust the senses aligns with the typical inclination of obsessive patients to engage in hyper-prudential reasoning in critical situations (aimed at not overlooking even the remotest possibility of being guilty). On the contrary, the association of altruistic guilt with lower expressed symptomatology and less reliance on inferential confusion could be explained by the potential involvement of a purpose other than not being morally dirty namely the purpose of helping, assisting, which does not allow the individual to consider all possible alternatives. Consistent with this view, are the data negatively linking altruistic guilt and disgust (Mancini et al., 2022), possibly reflecting the two distinct evolutive functions of disgust (e.g. protect against contamination) and altruism (e.g. the care of the sick) (Steinkopf, 2017). Indeed, the connection between deontological guilt and disgust is reflected by the "Lady Macbeth effect," a relationship between dirtiness, moral impurity, and the need for washes to restore moral purity (Zhong & Liljenquist, 2006). Several behavioral and neuroimaging studies have shown that the induction of deontological guilt leads to the "Lady Macbeth effect" and the need to perform washing rituals. Crucially, the induction of altruistic guilt did not elicit the same effect (D'Olimpio & Mancini, 2014; Ottaviani et al., 2018, 2019). Furthermore, previous research has shown that inducing different types of guilt leads to different courses of action. Specifically, participants induced with deontological guilt prefer omissive choices in the trolley dilemma paradigm (choosing not to pull the lever and kill one person in order to save five), while participants induced with altruistic guilt prefer the consequentialist choice (pull the lever and kill one in order to save 5) (Mancini and Gangemi, 2014). Furthermore, the induction of deontological guilt and pride had contrasting effects on the choice to accept unfair offers in the ultimatum game. In that, deontological participants accepted more often unfair offers as compared to participants who were induced with pride. However, fairness judgments did not differ between groups, suggesting that deontological participants' moral standards remained intact, but their moral self-worth diminished after induction. Again, participants who were induced with altruistic guilt did not show the same choice-pattern (Mancini and Mancini, 2015). Therefore, our results confirm the hypothesis that Inferential Confusion could be a byproduct of the goal of not feeling morally dirty and degraded, in other words of the fear of being deontologically guilty.

A recent study used a double Inference Process Task paradigm and showed that high levels of Feared Self (Markus & Nurius, 1986) seem to predict greater obsessive doubt and urgency to act when the provided information was linked to a threat (Yang et al., 2021). The feared Self is defined as a set of qualities that one does not want to become or is concerned that he/she may already be, such as "the

rejected self” or the “unsuccessful self” (Markus & Nurius, 1986; Oyserman & Markus, 1990). Consistently, previous research has shown that participants who believed their actual self was close to the feared-self showed greater levels of guilt and anxiety (Carver et al., 1999). Importantly, individuals with OCD were found to have distinctive feared self traits related to being bad, immoral, or insane (Ferrier & Brewin, 2005), while for instance people with Generalised Anxiety Disorder tended to endorse a symptom-related feared self (e.g., an anxious and depressed self), whereas nonclinical participants endorsed a more general, “flawed-self” (Ferrier & Brewin, 2005). Our results expand previous findings suggesting that what is increasing the tendency to obsessively doubt perceptual reality, is a specific type of feared-self, which is of being “morally dirty” and “guilty”, and “with a dirty conscience” whereas the failure of the goal of being altruistic diminishes Inferential reasoning. Supporting this view, a recent study found that OCD traits' susceptibility to deontological (vs. altruistic) guilt is linked primarily to perceived moral instability. Conversely, moral instability has been found to be negatively related to altruistic (vs. deontological) guilt (Giacomantonio et al., 2024). It seems plausible that a fragile and instable moral-self enhances the tendency to reason in a hyper-prudential way, leading to inferential confusion.

5. Limitations

The present study is not devoid of limitations, firstly our data are correlational and future works should involve a more experimental approach. Secondly, the sample is composed by a subclinical sample and in the future the link between deontological guilt and inferential reasoning should be directly assessed in OCD patients. However, it is worth nothing than more than the 60% of our sample scored above the OCI-12 clinical cut-off.

6. Conclusions

Our results are consistent with existing literature emphasizing the importance of deontological guilt in the genesis of obsessive-compulsive disorder. Some authors view inferential confusion as a bias that independently leads to OCD (Ardema, O'Connor, 2003; Ardema et al., 2005; Aardema, O'Connor, Pélissier, and Lavoie, 2009). Our study suggests inferential confusion is linked to deontological guilt, serving the anti-goal of avoiding guilt and/or contamination. As extensively demonstrated in the literature, the activation of the mental and emotional state of guilt leads individuals to engage in hyper-prudential reasoning, causing the subject to consider every possible alternative to ward off the hypothesis, even the most remote, of being responsible or having had the opportunity to prevent the danger and not having done anything to avoid it (Mancini, 2018). Thus, in OCD inferential reasoning appears to be aimed at a purpose – i.e. not being deontologically guilty.

Declarations

5.1. Ethics approval and consent to participate

The study was approved by the Ethical Committee of the School of Cognitive Psychotherapy (SPC), Rome, Italy, and was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants prior to their participation in the study.

5.2 Consent for publication

Not applicable.

5.3 Competing interests

The authors declare that they have no competing interests as defined by BMC, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

5.4 Funding

This research did not receive funding.

5.5 Availability of data and materials

The data supporting the findings of this study are not publicly available due to confidentiality and data protection considerations. Access to the data may be requested from the corresponding author and will be considered on a case-by-case basis, subject to applicable ethical and data protection requirements.

5.6 Authors' contributions

Alessandra Mancini: Conceptualization, Methodology, Formal analysis, Writing - Original Draft;

Simone Peverieri: Data Curation, Writing - Original Draft, Writing - Review & Editing;

Monica David: Writing - Original Draft, Writing - Review & Editing;

Umberto Granziol: Writing - Review & Editing;

Francesco Mancini: Resources, Writing - Review & Editing, Supervision.

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