The Relationship Between Guilt and Prosocial Behavior: Evidence from Meta-Analysis

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Abstract

Guilt, as a typical moral emotion, is considered to serve a prosocial function; however, many studies have found that guilt does not always promote prosocial behavior. To clarify the effect of guilt on prosocial behavior and analyze possible reasons for the divergent conclusions, this study employed a meta-analytic approach to examine the relationship between trait guilt and prosocial behavior, as well as the impact of state guilt on prosocial behavior. A total of 46 articles with 92 independent samples were included in the meta-analysis (N = 17248). The meta-analytic results indicated that: (1) There exists a moderate positive correlation between trait guilt and prosocial behavior, and this relationship is moderated by the type of prosocial behavior. Specifically, compared with donation, helping, environmental behavior, etc., the correlation between trait guilt and compensation is stronger; (2) Priming state guilt can significantly enhance individuals' prosocial behavior, but the association between the two shows a small effect size, with the target of prosocial behavior serving as a moderator. Individuals experiencing guilt are more willing to engage in prosocial behavior toward the victim party; (3) p-curve analysis revealed that the p-curves for both meta-analytic studies were significantly right-skewed, indicating that the relationship between trait guilt and prosocial behavior and the effect of state guilt on prosocial behavior represent genuine effects rather than being attributable to publication bias or p-hacking.

Full Text

The Relationship Between Guilt and Prosocial Behavior: Evidence from Meta-Analysis

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Abstract: As a typical moral emotion, guilt is believed to have prosocial functions, yet many studies have found that guilt does not always promote prosocial behavior. To clarify the effect of guilt on prosocial behavior and analyze potential causes of inconsistent findings, this study employed meta-analysis to examine the relationship between trait guilt and prosocial behavior, as well as the impact of state guilt on prosocial behavior. A total of 46 papers with 92 independent samples were included in the meta-analysis (N = 17,248). The results indicated that: (1) Trait guilt showed a moderate positive correlation with prosocial behavior, and this relationship was moderated by the type of prosocial behavior. Specifically, the correlation between trait guilt and compensation was stronger than that with donation, helping, environmental behavior, etc. (2) Inducing a state of guilt significantly increased individuals' prosocial behavior, but the association showed a small effect size. The target of prosocial behavior played a moderating role, with individuals experiencing guilt being more willing to engage in prosocial behavior toward victims. (3) P-curve analysis revealed that the p-curves for both meta-analyses were significantly right-skewed, indicating that the relationship between trait guilt and prosocial behavior and the effect of state guilt on prosocial behavior represent genuine effects rather than artifacts of publication bias or p-hacking.

Keywords: guilt; prosocial behavior; meta-analysis; moderating effect; p-curve

1.1 Background and Significance

The role of moral emotions in human moral behavior has long been controversial. Over the past several decades, numerous psychologists and economists have begun to examine the role that guilt, as a moral emotion, plays in individuals' prosocial behavior. When people feel guilty, they strive to remedy their mistakes in order to reduce, eliminate, or avoid this distressing feeling. Therefore, despite being an unpleasant moral emotion, guilt is considered to have prosocial functions and is regarded as an "adaptive emotion" [?, ?, ?, ?, ?, ?, ?, ?, ?, ?]. However, existing studies have reported inconsistent conclusions regarding the relationship between guilt and prosocial behavior. Most researchers believe that guilt is positively correlated with prosocial behavior or can significantly promote its occurrence (e.g., Harth, Leach, & Kessler, 2013; Rotella & Richeson, 2013). For instance, Jordan, Flynn, and Cohen (2016) used the Guilt and Shame Proneness Scale (GASP) and the Heartland Forgiveness Scale (HFS) to collect data and found that participants' guilt levels were significantly positively correlated with forgiveness intentions. Kahn, Liberman, Halperin, and Ross (2016), studying Israeli Jews, found that the more guilt participants felt about Israeli atrocities against Palestinians, the more they tended to support cooperative proposals. When individuals realize their actions have harmed others, guilt experiences drive them to compensate. If they cannot compensate the victim, they will find other ways to eliminate or reduce this experience [?, ?, ?]. Thus, guilt is considered prosocial.

However, some researchers have found no significant correlation between guilt

and prosocial behavior (e.g., Leach, Iyer, & Pedersen, 2006; Halmburger, Baumert, & Schmitt, 2015). Halmburger et al. (2015) created a real-life scenario of stealing a mobile phone in the laboratory and found that participants' guilt levels were not significantly correlated with moral courage to stop the violation. Graton, Ric, and Gonzalez (2016), studying French participants, induced guilt by asking them to recall personal guilt experiences and found that guilt levels could not significantly predict participants' willingness to engage in environmental behavior. Some researchers have proposed that behavioral tendencies following guilt are moderated by multiple factors, such as perceived difficulty of compensating the victim [**?**, **?**], the victim' s social status [**?**, **?**], and personal costs [**?**, **?**, **?**, **?**, **?**]. Therefore, guilt does not always promote prosocial behavior. Additionally, some studies have found a negative correlation between guilt and prosocial behavior. Wohl, Matheson, Branscombe, and Anisman (2013) induced guilt in Canadian participants by presenting materials about the historical head tax imposed on Chinese immigrants and found that guilt intensity was significantly negatively correlated with participants' willingness to increase contact with the victimized group. Guilt is a negative emotion that typically causes distress and unease, so when guilt arises, people may adopt various measures to reduce it [**?**, **?**, **?**, **?**], but not necessarily through prosocial behavior—they may also eliminate guilt through distortion, denial, or raising moral standards.

To clarify the relationship between guilt and prosocial intentions, Tignor and Colvin (2016) conducted a meta-analysis of relevant Western studies and found that trait guilt was significantly correlated with prosocial intentions ($k = 63$, $Mr = .13$, $p < .001$). This relationship was moderated by guilt measurement methods: trait guilt measured by scenario assessment showed a significant positive correlation with prosocial intentions, whereas trait guilt measured by checklist did not. This meta-analysis partially explained the contradictory relationship between guilt and prosocial intentions, but had several limitations: (1) It aimed to examine trait guilt and prosocial intentions, excluding experimental studies that manipulated guilt; (2) The prosocial intentions in this meta-analysis used four trait indicators—hostility, empathy, forgiveness, and morality—rather than prosocial behavior in the general sense; (3) Only Western adult participants were included, excluding studies from other cultural backgrounds and age groups; (4) Only individual guilt was examined, without considering group-based guilt; (5) Only one moderating variable—trait guilt measurement method—was examined.

Reviewing previous literature on the relationship between guilt and prosocial behavior, we identified several main reasons for inconsistent conclusions: (1) Different measurement and induction methods for guilt; (2) Different types of guilt; (3) Different types of prosocial behavior; (4) Different targets of prosocial behavior; (5) Control group settings. Additionally, due to differences in cultural origins and developmental histories, Chinese and Western cultures have fundamentally different values [**?**, **?**]. Whether the relationship between guilt and prosocial behavior differs across cultural backgrounds remains underexplored. This study uses meta-analysis to examine the relationship between guilt and

prosocial behavior, incorporating the above factors as moderators to further clarify the reasons for contradictory findings.

1.2.1 Different Induction Methods for Guilt

Guilt is a negative emotional experience characterized by remorse, unease, and self-blame that arises when individuals believe they have harmed others through real or imagined behavior for which they should be responsible [?, ?, ?, ?, ?, ?]. Based on this definition, guilt can be induced through three main methods: real situations, recall paradigm, and material priming.

Real situation induction primarily involves simulating authentic scenarios in the laboratory or using games to elicit guilt experiences. For example, Zhang Xiaoxian and Sang Biao (2012) had participants complete a Chinese reading test in groups of three, informing them that their poor performance had negatively affected the group' s results, thereby inducing guilt. The recall paradigm requires participants to recall personal guilt experiences and then self-report their current guilt levels. Polman and Ruttan (2012) asked participants to recall and describe past guilt-inducing experiences and report their current feelings, effectively inducing guilt. Material priming presents participants with appropriate moral scenarios and asks them to imagine themselves in those situations to induce guilt. Furukawa, Nakashima, and Morinaga (2016) presented a scenario about borrowing someone' s car and losing it, asking participants to imagine themselves in that situation, and found that the material effectively induced guilt.

Zhang Xiaoxian et al. (2012) used real situation induction to elicit guilt and then measured participants' prosocial intentions and behaviors, finding only marginally significant differences between the induction and control groups. Graton et al. (2016) used the recall paradigm to induce guilt and found that guilt levels could not significantly predict prosocial intentions. Zhang, Chen, Wang, Jiang, Xu, and Zhao (2017) used material priming to induce guilt and found that guilty participants chose significantly more volunteer time than the control group. These findings demonstrate that different guilt induction methods yield inconsistent relationships between guilt and prosocial behavior.

1.2.2 Different Measurement Tools for Guilt

In addition to being viewed as a state emotional experience, guilt is also considered a trait that can be assessed through self-report methods to identify individuals prone to guilt (guilt proneness or guilt disposition), such as the Guilt and Shame Proneness Scale (GASP) [?, ?, ?, ?, ?] and the Chinese Guilt Questionnaire [?, ?]. However, measurement tools for trait guilt are not standardized. Besides the GASP and Chinese Guilt Questionnaire, the Test of Self-Conscious Affect (TOSCA), developed and revised by Tangney in 1990, can also measure guilt experiences. Additionally, due to varying research needs, many researchers do not use existing formal questionnaires but instead develop

their own scenario-based questionnaires. Linda, Stefan, and Gregorio (2016) used the GASP to examine the relationship between guilt proneness and altruistic tendencies, finding a significant positive correlation. Li Lei (2012) used a self-developed "Middle School Student Guilt Scale" and found no significant correlation between guilt proneness and altruistic tendencies. Therefore, differences among trait guilt measurement tools likely contribute to inconsistent findings regarding the guilt-prosocial behavior relationship.

1.2.3 Different Types of Guilt

Based on different criteria, guilt can be classified into various types. In research on guilt and prosocial behavior, guilt is primarily categorized as individual-based guilt or group-based guilt according to the source of responsibility. Individual-based guilt refers to the emotional experience that arises when an individual harms others and recognizes personal responsibility [?, ?, ?]. Group-based guilt emerges when an individual' s group commits immoral acts or harms another group, and the individual recognizes that their group should be held responsible [?, ?]. Group-based guilt is a collective emotion that differs from individual-based guilt in that individuals can experience group-based guilt even if they were not personally involved in the immoral act or its consequences and even if someone has already been held accountable [?, ?, ?, ?, ?]. Since individual-based guilt and group-based guilt differ in both antecedents and mechanisms, their relationships with prosocial behavior may also differ.

1.2.4 Different Types of Prosocial Behavior

In psychological research, most scholars consider prosocial behavior to encompass a range of behaviors intended to benefit any individual, group, or society other than oneself [?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?]. Depending on research needs, researchers have selected different behaviors as indicators of prosocial behavior, primarily including helping, cooperation, sharing, sympathy, donation, friendly attitudes, volunteer time, and other positive, socially responsible behaviors [?, ?, ?, ?, ?, ?]. However, existing research shows inconsistent relationships between guilt and different types of prosocial behavior. For example, Kahn et al. (2016) found that the more guilt Israeli Jewish participants felt about Israeli atrocities against Palestinians, the more they tended to support cooperative proposals and show friendly attitudes toward outgroups. Zhang Xiaoxian et al. (2012), using helping behavior as an indicator, found that guilt experiences only marginally significantly affected helping intentions and actual helping behavior. Graton et al. (2016), using environmental behavior as the dependent variable, found that guilt levels could not significantly predict environmental behavior intentions. Thus, the relationship between guilt and different types of prosocial behavior remains inconsistent.

1.2.5 Different Targets of Prosocial Behavior

It is widely accepted in psychological research that individuals experiencing guilt are inclined to compensate victims. However, a neglected question is whether guilt also affects prosocial behavior toward unrelated parties. Some researchers have found that inducing guilt significantly increased participants' donations to unrelated others (flood victims) [?, ?]. However, Ding Fang, Zhou Yun, and Hu Yu (2014) induced guilt and examined participants' fairness behavior, finding that guilt experiences positively predicted fairness toward victims but did not affect fairness toward third parties. These findings suggest that the prosocial effects of guilt may be limited in terms of target, and whether the positive social effects of guilt can generalize to society as a whole remains to be further explored.

1.2.6 Different Control Group Settings

As an emotional experience, guilt has been studied experimentally not only by comparing guilt induction groups with neutral control groups but also by comparing guilt with other emotions, most commonly shame. Both guilt and shame are negative moral emotions that share similar eliciting situations at both individual and group levels. Research shows that individuals experiencing group-level negative events simultaneously experience group-based guilt and group-based shame, which are considered co-occurrent [?, ?, ?, ?, ?]. de Hooge, Zeelenberg, and Breugelmans (2007) used the recall paradigm to induce guilt and shame separately and found that guilt versus shame did not significantly enhance cooperative behavior. Furukawa et al. (2016) presented different materials and asked participants to imagine themselves in the scenarios to induce guilt and shame. The results showed no significant difference in compensation to victims between the guilt and shame groups, but compared with the neutral group, the guilt group showed higher compensation intentions. Some researchers suggest that shame is more intense and painful than guilt [?, ?, ?, ?]. Thus, inconsistent findings regarding the guilt-prosocial behavior relationship may be due to different control group settings across studies.

1.3 Purpose of This Study

To address the inconsistencies in the guilt-prosocial behavior relationship, this study uses meta-analysis to examine the relationships between trait guilt, state guilt, and prosocial behavior. Building on this foundation, we test the moderating effects of guilt measurement/induction methods, guilt type, prosocial behavior type, prosocial behavior target, control group settings, and cultural factors. Through this meta-analysis, we aim to provide a comprehensive and clear understanding of the relationship between guilt and prosocial behavior and further elucidate the role of moral emotions in moral decision-making.

2.1 Literature Search

Chinese literature was primarily searched from CNKI Journal Full-text Database, China Science and Technology Journal Database, China Doctoral Dissertation Full-text Database, and China Master' s Thesis Full-text Database. Search terms for guilt included "guilt" (内疚), "remorse" (愧疚), and "moral emotion" (道德情绪). Search terms for prosocial behavior included "prosocial behavior" (亲社会行为), "cooperation" (合作), "helping behavior" (助人行为), "altruistic behavior" (利他行为), "fairness" (公平), "donation" (捐赠), and "apology" (道歉). English literature was primarily searched from Scopus, Springer Link, Elsevier, and Wiley Online Library. Search terms for guilt included "guilt," "regret," "group-based guilt," and "collective guilt." Search terms for prosocial behavior included "prosocial behavior," "helping behavior," "altruism," "altruistic behavior," and "compensate." The search timeframe was limited to 1990–2017.

2.2 Inclusion and Exclusion Criteria

The following criteria were used to determine whether retrieved literature was included in the meta-analysis: (1) Studies must be empirical investigations of the relationship between guilt and prosocial behavior with complete statistical data and clear sample sizes; purely theoretical and review articles were excluded; (2) Studies must examine the correlation between trait guilt and prosocial behavior and explicitly report r values or F, t, or ^{2} values that could be converted to r; data using structural equation modeling, regression analysis, or other statistical methods were excluded; (3) Studies examining the effect of induced state guilt on prosocial behavior must include a comparison between a guilt induction condition and a control condition; studies reporting only prosocial behavior under guilt induction without a control group (including pre-post comparisons) were excluded; (4) Participants must be normal individuals; studies using clinical populations (e.g., psychiatric patients) were excluded; (5) When data were duplicated across studies, only one was included.

2.3 Search and Inclusion Results

The literature search, inclusion, and exclusion process is shown in Figure 1 [Figure 1: see original paper]. Ultimately, 46 papers were included, comprising 14 Chinese and 32 English papers, with 35 published articles. Among these, 34 papers were included in the analysis of trait guilt and prosocial behavior, and 14 papers were included for state guilt. Two papers contained different studies that were included in both the trait guilt and state guilt analyses.

2.4 Literature Coding

Studies included in the meta-analysis were coded for: (1) publication information (author + year); (2) sample size; (3) participant nationality; (4) participant age (child, adolescent, or adult); (5) trait guilt measurement tool (see Table 1

); (6) guilt nature (see Table 1); (7) guilt type (individual-based guilt or group-based guilt); (8) prosocial behavior type; (9) prosocial behavior target; (10) publication status; (11) cultural background of the sample; (12) state guilt induction method (see Table 2). For each independent sample, one effect size was calculated. If a paper contained multiple independent samples, multiple codings were performed. For state guilt studies reporting multiple experimental conditions, to avoid generating excessive effect sizes from a single paper that might bias results by giving it undue weight, we pooled effect sizes following these principles: if a study reported guilt levels under multiple conditions and these conditions (e.g., participant gender) were not moderators of interest in this study, they were averaged into a single pooled effect size; however, if the variable was a moderator of interest (e.g., participant age, state guilt induction method), pooling was not performed. Details are shown in Tables 1 and 2.

Table 1
Original Studies Included in the Meta-Analysis (Relationship Between Trait Guilt and Prosocial Behavior)

Study (Year)	Sample Size	Age	Measurement Tool	Guilt Nature	Guilt Type	Prosocial Behavior Type	Target	Publication Status	Culture
Ding, W., 2015									
Fang, Y., 2017									
Huang, X., 2016-a									
Huang, X., 2016-c									
Kang, J., 2014									
Li, L., 2012-a									
Li, L., 2012-b									

Study (Year)	Sample Size	Age	Measurement Tool	Guilt Nature	Guilt Type	Prosocial Behavior Type	Target	Publication Status	Culture
Li, J., 2008									
Liu, J., 2009-a									
Liu, X., 2011-a									
Lü, L., 2017									
Mao, J., 2012									
Brown & Cehajic, 2008-a									
Brown & Cehajic, 2008-b									
Cehajic-Clancy et al., 2011-a									
Cehajic-Clancy et al., 2011-b									
Figueiredo et al., 2015									
Halmburger et al., 2015									

Study (Year)	Sample Size	Age	Measurement Tool	Guilt Nature	Guilt Type	Prosocial Behavior Type	Target	Publication Status	Culture
Harth et al., 2013-a									
Harth et al., 2013-a									
Harth et al., 2013-b									
Harth et al., 2013-b									
Iyer et al., 2007-a									
Iyer et al., 2007-b									
Jordan et al., 2014-a									
Kahn et al., 2016-a									
Kahn et al., 2016-b									
Konstam et al., 2011									

Study (Year)	Sample Size	Age	Measurement Tool	Guilt Nature	Guilt Type	Prosocial Behavior Type	Target	Publication Status	Culture
Leach et al., 2006-a									
Leach et al., 2006-b									
Leonard et al., 2015-a									
Linda et al., 2016									
Mashui et al., 2017-a									
Mashui et al., 2017-b									
Mcgarty et al., 2005-a									
Mcgarty et al., 2005-b									
Ongley et al., 2014									
Roberts et al., 2014									
Roberts et al., 2014									

Study (Year)	Sample Size	Age	Measurement Tool	Guilt Nature	Guilt Type	Prosocial Behavior Type	Target	Publication Status	Culture
Roos et al., 2014									
Rotella & Richeson, 2013-b									
Shepherd et al., 2013-a									
Shepherd et al., 2013-b									
Strelan, 2007									
Swim & Miller, 1999-a									
Swim & Miller, 1999-b									
Swim & Miller, 1999-c									
Swim & Miller, 1999-d									

Study (Year)	Sample Size	Age	Measurement Tool	Guilt Nature	Guilt Type	Prosocial Behavior Type	Target	Publication Status	Culture
Wan et al., 2016-a									
Wan et al., 2016-b									
Wohl et al., 2017-a									
Wohl et al., 2017-b									
Zimmermann et al., 2011-a									
Zimmermann et al., 2011-b									

Notes: (1) C = Child, A = Adolescent, Ad = Adult; (2) Q = Formal questionnaire, UQ = Self-developed questionnaire; (3) T(trait) = Trait guilt, S(status) = State guilt; (4) GBG(group-based guilt) = Group-based guilt, IBG(individual-based guilt) = Individual-based guilt; (5) T(trait) = Prosocial trait, R(reparation) = Compensation, C(cooperation) = Cooperation, E(environmental) = Environmental behavior, F(forgiveness) = Forgiveness, O(other) = Other prosocial behaviors, I(intergroup support) = Intergroup support; (6) V = Victim as target, NV = Non-victim as target, UV = Unspecified target; (7) P = Published article, UP = Unpublished; (8) W = Western culture, E = Eastern culture; (9) Suffixes a, b, c after author names and years represent different studies within the same paper. Entries without suffixes are from the same study within a paper.

Table 2
Original Studies Included in the Meta-Analysis (Effect of State Guilt on Prosocial Behavior)

Study (Year)	Sample Size	Age	Guilt Type	Induction Method	Prosocial Behavior Type	Target	Control Group	Publication Status	Culture
Ding, F., et al., 2014-a									
Ding, F., et al., 2014-b									
Du, L., 2012-a									
Du, L., 2012-b									
Du, L., 2012-b									
Liu, X., 2011-b									
Sun, M., 2015									
Zhang, X., et al., 2012-a									
Zhang, X., et al., 2012-b									

Study (Year)	Sample Size	Age	Guilt Type	Induction Method	Prosocial Behavior Type	Target	Control Group	Publication Status	Culture
de Hooge et al., 2007-a									
de Hooge et al., 2007-a									
de Hooge et al., 2007-b									
de Hooge et al., 2007-b									
de Hooge et al., 2011-a									
de Hooge et al., 2011-a									
de Hooge et al., 2011-b									
de Hooge et al., 2011-b									

Study (Year)	Sample Size	Age	Guilt Type	Induction Method	Prosocial Behavior Type	Target	Control Group	Publication Status	Culture
de Hooge et al., 2011-c									
de Hooge et al., 2011-c									
de Hooge et al., 2011-d									
de Hooge et al., 2011-d									
de Hooge et al., 2011-e									
de Hooge et al., 2011-f									
de Hooge et al., 2011-f									
Ferguson & Branscombe, 2010									

Study (Year)	Sample Size	Age	Guilt Type	Induction Method	Prosocial Behavior Type	Target	Control Group	Publication Status	Culture
Furukawa et al., 2016-a									
Furukawa et al., 2016-b									
Graton et al., 2016-a									
Graton et al., 2016-a									
Graton et al., 2016-b									
Graton et al., 2016-c									
Jordan et al., 2014-b									
Jordan et al., 2014-c									
Polman & Ruttan, 2012									
Solak et al., 2016-a									

Study (Year)	Sample Size	Age	Guilt Type	Induction Method	Prosocial Behavior Type	Target	Control Group	Publication Status	Culture
Solak et al., 2016-b									
Solak et al., 2016-b									
Zhang et al., 2017									

Notes: (1) C = Child, A = Adolescent, Ad = Adult; (2) GBG(group-based guilt) = Group-based guilt, IBG(individual-based guilt) = Individual-based guilt; (3) CS = Real situation induction, GR = Guilt recall paradigm, MS = Material priming; (4) R(reparation) = Compensation, E(environmental) = Environmental behavior, O(other) = Other prosocial behaviors, D(donation) = Donation, H(help behavior) = Helping behavior; (5) V = Victim as target, NV = Non-victim as target; (6) C = Neutral control group, S = Shame control group; (7) P = Published article, UP = Unpublished; (8) W = Western culture, E = Eastern culture; (9) Suffixes a, b, c after author names and years represent different studies within the same paper. Entries without suffixes are from the same study within a paper.

2.4.1 Effect Size Calculation

To examine the relationship between trait guilt and prosocial behavior, correlation coefficient r was used as the effect size. During coding, some studies did not directly report the correlation between guilt and prosocial behavior but reported F, t, or ^{2} values, which we converted to r values using formulas from Wang Jie, Chen Jianzhi, Yang Lin, and Gao Shuang (2013):

$$r = \sqrt{\frac{t^2}{t^2 + df}}, \quad df = n_1 + n_2 - 2$$

$$r = \sqrt{\frac{F}{F + df}}, \quad df = n_1 + n_2 - 2$$

$$r = \sqrt{\frac{\chi^2}{\chi^2 + N}}$$

Some studies reported correlation coefficients for different age groups; since age was a moderator of interest in this meta-analysis, these were coded separately. Some studies only reported correlations between guilt subscales and prosocial behavior; we synthesized these using the r-to-Fisher-Z method to obtain the correlation between the total guilt scale and prosocial behavior.

To examine the effect of state guilt on prosocial behavior, we compared differences in prosocial behavior between guilt induction and control conditions. Therefore, Cohen' s d was used as the effect size. For studies reporting raw data (sample size, mean, standard deviation), Cohen' s d was calculated directly. For studies reporting F, t, or ^{2} values, appropriate conversion formulas were used. We present each independent effect size from each study, so some papers contain multiple independent effect sizes. Ultimately, 92 independent effect sizes were obtained.

2.4.2 Model Selection

Meta-analysis primarily uses either fixed-effect or random-effects models, with the main difference being the weighting components. The fixed-effect model assumes that all studies in the meta-analysis share a single true effect size, with variation across studies due solely to sampling error. The random-effects model assumes that each study has its own true effect size, with variation across studies due to both true effect size differences and sampling error [**?**, **?**, **?**, **?**, **?**]. In model selection, if studies in the meta-analysis are functionally identical and the overall effect is intended to generalize only to the populations represented in the included studies, the fixed-effect model is appropriate. Conversely, if studies involve different participant populations and measurement tools, and there is reason to believe these differences affect results, the random-effects model is more appropriate [**?**, **?**]. In this meta-analysis, the 46 included studies used different measurement tools for guilt and prosocial behavior and involved samples from different cultural groups, making the fixed-effect model inappropriate. Furthermore, this meta-analysis examines moderating effects of age, guilt measurement/induction methods, guilt type, prosocial behavior type, prosocial behavior target, and cultural background, making the random-effects model more suitable. Heterogeneity tests were conducted to validate this model selection.

2.4.3 Publication Bias

Publication bias occurs when published studies do not systematically represent the complete body of research conducted in a field [**?**, **?**, **?**, **?**]. Publication bias means the research literature in a domain is incomplete, which can seriously affect meta-analytic results by potentially inflating the obtained effect size beyond the true value [**?**, **?**, **?**, **?**, **?**]. To address publication bias, we first attempted to obtain unpublished literature during the search phase. In the meta-analysis, we used funnel plots, Egger' s test, and the trim-and-fill method to assess publication bias.

Funnel plots provide a visual preliminary check for publication bias. If effect sizes are symmetrically distributed around the overall effect, publication bias is unlikely; asymmetry suggests potential bias [?, ?]. Egger' s linear regression test assesses publication bias by estimating the intercept of a linear regression equation and its 95% confidence interval. A non-significant intercept indicates no publication bias [?, ?, ?, ?, ?]. The trim-and-fill method trims and imputes studies to achieve symmetry around the average effect size and re-estimates the true pooled effect [?, ?]. If the imputed effect size does not change significantly, publication bias is unlikely [?, ?, ?].

2.4.4 P-Curve Analysis

P-curve analyzes the distribution of p-values in published studies to determine whether findings provide evidential value for a true phenomenon or reflect publication bias and p-hacking (the practice of reporting only significant results after data inspection, such as deciding which outliers to exclude, when to stop data collection, or whether to include covariates). This reasoning is based on evidence that studies with true effects (H_1 is true) are more likely to produce very low p-values ($p < 0.025$) than p-values in the higher significance range ($0.025 < p < 0.05$). Therefore, the p-curve distribution should be right-skewed when true effects exist, whereas null effects (H_1 is false) produce a uniform p-curve. A "flat" p-curve indicates a lack of evidential value [?, ?, ?, ?].

P-curve assesses the skewness of p-value distributions to determine evidential value. Two methods test p-curve skewness: (1) binomial test, comparing probabilities of $p < 0.025$ versus $p > 0.025$; and (2) continuous test, calculating pp-values (the probability of obtaining a value smaller than the observed p-value under the null hypothesis; $pp = p/.05$ for uniform distribution) and using Stouffer' s method to test for right skewness [?, ?]. P-curve aims to test p-value distributions in published studies, so inclusion criteria exclude unpublished studies and non-significant results ($p > 0.05$).

2.4.5 Data Analysis and Processing Procedures

Excel was used for preliminary literature organization and coding. The metafor package in R was used for effect size calculation, publication bias testing, and moderator analysis [?, ?].

3.1 Heterogeneity Test

Heterogeneity tests were conducted separately for the meta-analysis of trait guilt and prosocial behavior and for state guilt and prosocial behavior. Q tests indicated that effect sizes were heterogeneous across studies: $Q(53) = 739.72$, $p < 0.001$, $I^2 = 94.33\%$ for trait guilt; $Q(37) = 129.56$, $p < 0.001$, $I^2 = 75.55\%$ for state guilt. According to Borenstein et al.' s (2009) interpretation of I^2, 94.33% (75.55%) of observed variance was due to true differences in the relationship. These results support the appropriateness of using random-effects models.

3.2 Publication Bias Test

First, funnel plots were used to examine publication bias. As shown in Figure 2 [Figure 2: see original paper], with Fisher' s Z or Cohen' s d on the x-axis and standard error on the y-axis, studies were roughly symmetrically distributed around the overall effect, suggesting minimal publication bias. For more precise assessment, Egger' s test was conducted. Results showed no publication bias for the trait guilt-prosocial behavior meta-analysis, Z = -1.05, p = 0.293, or for the state guilt-prosocial behavior meta-analysis, Z = -0.53, p = 0.596.

Figure 2. Funnel plots for studies on trait guilt and prosocial behavior (left) and state guilt and prosocial behavior (right)

We further used Duval and Tweedie' s (2000) trim-and-fill method to assess the impact of publication bias. After imputing potentially missing studies, the overall effects remained significant under random-effects models (trait guilt: before trimming Z = 9.33, p < 0.001, r = 0.36; after trimming Z = 9.33, p < 0.001, r = 0.36; state guilt: before trimming Z = -3.62, p < 0.001, d = 0.24; after trimming Z = -3.62, p < 0.001, d = 0.24). These results indicate minimal publication bias.

3.3 Main Effects

Main effects were tested separately for trait guilt-prosocial behavior and state guilt-prosocial behavior. Trait guilt showed a moderate positive correlation with prosocial behavior, r = 0.36 (CI = 0.28–0.43, Z = 9.33, p < 0.001; see Figure 3 [Figure 3: see original paper]). The main effect of state guilt on prosocial behavior was significant, Z = 3.62, p < 0.001, with a small effect size, d = 0.24. According to Cohen' s (1992) criteria where d = 0.2, 0.5, and 0.8 represent small, medium, and large effects respectively, state guilt had a small effect on prosocial behavior (see Figure 4 [Figure 4: see original paper]).

Figure 3. Effect size distribution for trait guilt and prosocial behavior
Figure 4. Effect size distribution for state guilt and prosocial behavior

3.4 P-Curve Analysis Results

P-curve analysis was conducted separately for trait guilt-prosocial behavior and state guilt-prosocial behavior studies. Results showed that both p-curves were significantly right-skewed (trait guilt: Binomial test: p < 0.0001, Continuous test: z = -31.14, p < 0.0001; state guilt: Binomial test: p = 0.0036, Continuous test: z = -8.55, p < 0.0001). Specifically, for trait guilt, 43 of 47 p-values were below 0.025; for state guilt, 17 of 21 p-values were below 0.025 (see Figure 5 [Figure 5: see original paper]). These results indicate that the findings reflect genuine effects rather than publication bias or p-hacking.

Figure 5. P-curve for trait guilt and prosocial behavior (A) and state guilt and prosocial behavior (B)

3.5 Moderator Effect Tests

Moderator analysis was conducted for the random-effects model of trait guilt and prosocial behavior. Results showed that age (Q_B(2) = 0.79, p = 0.672), guilt measurement method (Q_B(1) = 0.19, p = 0.665), guilt type (Q_B(1) = 0.38, p = 0.538), prosocial behavior target (Q_B(2) = 0.61, p = 0.736), and cultural background (Q_B(1) = 0.04, p = 0.836) were not significant moderators. However, prosocial behavior type was a significant moderator (Q_B(6) = 20.33, p = 0.002). Compared with environmental behavior (r = -0.02), cooperation (r = 0.26), forgiveness (r = 0.07), prosocial traits (r = 0.36), and other prosocial behaviors (r = 0.25), the correlation between trait guilt and compensation was stronger (r = 0.53) (see Table 3).

Table 3
Moderator Analysis for Trait Guilt and Prosocial Behavior (Random-Effects Model)

Moderator	Q_B	df	p
Guilt Measurement Method	0.19	1	0.665
Prosocial Behavior Target	0.61	2	0.736
Prosocial Behavior Type	20.33	6	0.002

Note: k = number of study entries; same for Table 4 .

Moderator analysis for the random-effects model of state guilt and prosocial behavior showed that age (Q_B(2) = 1.54, p = 0.461), control group setting (Q_B(1) = 0.21, p = 0.650), prosocial behavior type (Q_B(4) = 7.15, p = 0.128), guilt type (Q_B(1) = 0.22, p = 0.642), guilt induction method (Q_B(2) = 3.25, p = 0.119), and cultural background (Q_B(1) = 1.39, p = 0.238) were not significant moderators. However, prosocial behavior target was a significant moderator (Q_B(1) = 6.72, p = 0.009). Compared with non-victims (d = 0.12), when the prosocial behavior target was the victim, the effect of state guilt on prosocial behavior was larger (d = 0.47) (see Table 4).

Table 4
Moderator Analysis for State Guilt and Prosocial Behavior (Random-Effects Model)

Moderator	Q_B	df	p
Control Group Setting	0.21	1	0.650
Guilt Induction Method	3.25	2	0.119
Prosocial Behavior Target	6.72	1	0.009
Prosocial Behavior Type	7.15	4	0.128

4.1 The Relationship Between Guilt and Prosocial Behavior

This meta-analysis examined the relationship between guilt, a moral emotion, and prosocial behavior. Results showed that trait guilt had a moderate positive correlation with prosocial behavior (r = 0.36), and the main effect of state guilt on prosocial behavior was significant with a small effect size (d = 0.24). Despite inconsistent findings in previous research, this study supports the conclusion that guilt can promote prosocial behavior to some extent.

Previous research indicates that individuals with high trait guilt have a strong sense of responsibility toward others [**?**, **?**]. When seeing others in need, guilt-prone individuals may feel greater responsibility to help [**?**, **?**]. Tignor et al.' s (2016) meta-analysis found that trait guilt was significantly correlated with prosocial traits. Many empirical studies have shown that trait guilt is positively correlated with law-abidingness, responsibility, empathy, agreeableness, and perspective-taking [**?**, **?**, **?**, **?**, **?**, **?**]. Thus, trait guilt is significantly positively correlated with prosocial behavior. Guilt is a negative self-conscious emotion that is often accompanied by distress, self-blame, and anxiety. Chronic guilt can lead to obsessive-compulsive disorders, psychosis, depression, pathological gambling, and persistent self-blame [**?**, **?**, **?**, **?**, **?**, **?**, **?**]. After experiencing guilt, individuals seek to reduce or eliminate this negative experience, and engaging in prosocial behavior is a common strategy. Therefore, the meta-analysis found that state guilt also significantly positively affected prosocial behavior, though with a small effect size. Some researchers have suggested that guilt reduction is not limited to prosocial behavior but may also occur through reducing immoral or criminal behavior [**?**, **?**, **?**, **?**, **?**, **?**]. Thus, state guilt promotes prosocial behavior but only to a small extent.

Research shows that individuals differ in their tendency and frequency of experiencing guilt, which is stable across time and situations [**?**, **?**]. Individuals with high trait guilt exhibit more and more stable prosocial behavior. Additionally, most trait guilt-prosocial behavior studies use self-report measures for both variables, which may create common method bias and inflate their correlation. State guilt is an anxious, uneasy feeling that arises when individuals violate moral or social standards [**?**, **?**]. It has clear antecedent conditions and, like other emotional states, is temporally limited. de Hooge et al. (2011) induced guilt through material priming and conducted a two-round three-person dictator game, finding that guilty participants allocated more lottery tickets or time to victims in the first round but showed no compensation intentions in the second round. State guilt requires specific events or situations to be induced and is a transient emotional experience, limiting its prosocial effectiveness. Therefore, the association between state guilt and prosocial behavior shows only a small effect size.

4.2 Factors Influencing the Guilt-Prosocial Behavior Relationship

To address previous inconsistencies, this study examined multiple moderators: trait guilt measurement methods, state guilt induction methods, guilt type, prosocial behavior type, prosocial behavior target, participant age, and cultural background. Moderator analyses revealed that prosocial behavior type significantly moderated the trait guilt-prosocial behavior relationship. Compared with donation, helping, and environmental behavior, the correlation between trait guilt and compensation was stronger. Prosocial behavior target significantly moderated the state guilt-prosocial behavior relationship. Compared with non-victims, participants induced to feel guilt were more willing to engage in prosocial behavior toward victims. No other moderators were significant.

Previous researchers have attempted to resolve contradictory conclusions about the guilt-prosocial behavior relationship. Some found that cognitive processing factors such as perceived severity of the event, difficulty of compensating the victim, and victim social status moderated the relationship [**?**, **?**, **?**]. Greene' s (2003) dual-process model of morality proposes that both moral cognitive processing and moral emotional processing occur simultaneously and compete. Our meta-analytic moderator results indicate that while guilt as a moral emotion plays a role, individual cognitive factors also contribute. Both the victim target in prosocial behavior and the compensation type suggest that when individuals feel guilty, they prefer to compensate victims to reduce or eliminate guilt. When the behavior target is a non-victim or the behavior type is other than compensation, individuals may not be willing to act despite emotional arousal, indicating that individuals consider costs and other cognitive factors alongside emotional drive. These results support the role of moral emotions in moral decision-making and corroborate the dual-process model.

The different moderators for trait guilt versus state guilt reflect methodological differences. In correlational studies of trait guilt and prosocial behavior, prosocial behavior is often measured by questionnaires, such as Fang Yuan' s (2017) study using the Prosocial Tendencies Measure (PTM) to assess college students' prosocial intentions. Due to limitations of questionnaire measures, participants may be influenced by social desirability or may not need to engage in actual behavior, reducing cognitive control. Thus, participants may not differentiate between prosocial behavior types, making the moderating effect non-significant. However, prosocial behavior targets are more distinct and may attract more attention, making the target a significant moderator of the trait guilt-prosocial behavior relationship.

In experimental studies of state guilt and prosocial behavior, guilt is typically induced and followed by behavioral experiments requiring participants to make donations or allocate tokens—concrete behaviors with direct costs. For example, Zhang Xiaoxian et al. (2012) used the actual number of questionnaires helped as an indicator of prosocial behavior to examine the relationship between children'

s guilt and prosocial behavior. Therefore, prosocial behavior type was a significant moderator in state guilt studies, whereas prosocial behavior target was less salient in actual cost comparisons. These differences reflect how different research methods affect moral cognition and emotion.

Trait guilt and state guilt differ not only in measurement methods but also in essence. State guilt is an immediate guilt experience; trait guilt is an individual' s general tendency to experience guilt—the frequency of guilt experiences—and represents a relatively stable individual characteristic [**?**, **?**, **?**, **?**]. Individuals high in trait guilt may more easily recall past wrongdoings after committing moral transgressions and subsequently make amends [**?**, **?**, **?**, **?**]. Those higher in trait guilt may use more time and methods to eliminate guilt and thus be more likely to engage in prosocial behavior toward victims. State guilt, like other emotional states, affects immediate behavioral reactions. Under state guilt, individuals may simply seek to quickly reduce anxiety and unease without distinguishing targets, engaging in prosocial behavior toward any target to achieve this goal. Therefore, prosocial behavior target was not a significant moderator for state guilt, whereas prosocial behavior type was. Additionally, some researchers suggest that trait guilt better reflects individual guilt levels than state guilt [**?**, **?**]. Thus, trait-guilt individuals may only be able to eliminate guilt by engaging in prosocial behavior specifically toward victims.

Notably, Tignor et al.' s (2016) meta-analysis of Western studies found that the trait guilt-prosocial intention relationship was moderated by measurement method: scenario-assessed trait guilt correlated significantly with prosocial intentions, whereas checklist-measured trait guilt did not. In contrast, our study found no significant moderating effects for either trait guilt measurement methods or guilt nature. An important reason may be that our meta-analysis differs fundamentally from Tignor et al.' s in its definition of the dependent variable. Tignor et al. used prosocial traits such as empathy as indicators of prosocial intentions, whereas our study defined prosocial behavior as any behavior benefiting others or society in the broad sense.

Additionally, state guilt induction method, guilt type, participant age, and cultural background were not significant moderators, suggesting that guilt' s effect on prosocial behavior is relatively stable. Although guilt develops with age, it remains a prosocial moral emotion across all developmental stages. The prosocial significance of guilt is not affected by cultural background in either Chinese or Western contexts. Moreover, guilt' s prosocial functions operate at both individual and group levels.

4.3 Future Directions

This meta-analysis demonstrates that guilt has positive social significance, but its effect on prosocial behavior is moderated by prosocial behavior target and type. Additionally, some researchers have found that guilt' s prosocial effects are temporally limited: after compensating victims once, guilty participants were no

longer willing to allocate more time to victims in a second round [**?**, **?**]. Future empirical research should further delineate when and to what extent guilt exerts its positive social effects. Furthermore, different research methods for studying guilt need to be integrated to obtain more valid results.

In conclusion, this meta-analysis found a moderate positive correlation between trait guilt and prosocial behavior, moderated by prosocial behavior type, with stronger correlations for compensation than for donation, helping, or environmental behavior. Inducing state guilt significantly increased prosocial behavior with a small effect size, significantly moderated by prosocial behavior target, with guilty participants more willing to engage in prosocial behavior toward victims. Measurement methods for trait guilt, induction methods for state guilt, guilt type, participant age, and cultural background were not significant moderators.

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Note: Figure translations are in progress. See original paper for figures.