A Three-Level Meta-Analysis of the Relationship Between Sadness and Prosocial Behavior

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Abstract

As one of the most fundamental emotional experiences in humans, the influence mechanism of sadness on prosocial behavior has long been a subject of controversy in academic circles. Traditional perspectives have predominantly emphasized its negative effects, yet empirical research findings exhibit significant inconsistencies. To clarify this controversy and uncover the reasons for inconsistent research findings, this study employs a random-effects model to conduct a three-level meta-analysis of 41 studies (70 effect sizes, total sample size of 10,173 participants) spanning nearly five decades. The results reveal a weak yet significant positive correlation between sadness and prosocial behavior (r=0.13, 95%CI[0.08,0.18]), with developmental stage significantly moderating this effect, while factors such as gender and induction method demonstrate no significant influence; P-curve analysis corroborates the authenticity of this effect, precluding the possibility of publication bias or phacking. This research challenges traditional negative perceptions of sadness, unveils the prosocial transformation potential embedded within sad emotions, and offers a novel perspective for emotional intervention.

Full Text

The Relationship Between Sadness and Prosocial Behavior: A Three-Level Meta-Analysis

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Abstract

As one of the most fundamental emotional experiences in humans, the impact of sadness on prosocial behavior has long been a subject of debate in academia.

Traditional perspectives often emphasize its negative effects, yet empirical findings remain inconsistent. To resolve this controversy and uncover the reasons for the divergent results, this study employed a random-effects model to conduct a three-level meta-analysis of 41 studies (70 effect sizes, total sample size = 10,173) spanning nearly 50 years. The results revealed a weak but significant positive correlation between sadness and prosocial behavior (r = 0.13, 95% CI [0.08, 0.18]). Developmental stage significantly moderated this effect, whereas factors such as gender and induction methods showed no significant influence. A p-curve analysis confirmed the genuineness of the effect, ruling out publication bias or p-hacking. This study challenges the traditional negative perception of sadness, highlighting its potential for prosocial transformation and offering new insights for emotional intervention.

Keywords: sadness, prosocial behavior, three-level meta-analysis, moderating effects

1 Introduction

Sadness, as a complex basic emotion, represents far more than a simple negative experience. It profoundly reflects individuals' internal responses to loss, separation, or setbacks and may trigger a series of complex social adaptation mechanisms (Gross & Barrett, 2011; Lerner & Keltner, 2000; Keltner & Haidt, 1999). Prosocial behavior, in turn, refers to voluntary actions that individuals undertake to promote the welfare of others or groups, with motivations rooted in multiple psychological mechanisms including altruism based on human nature, internalized social norms, and the realization of self-worth (Penner et al., 2005; Batson, 1987; Carlo & Randall, 2002; Eisenberg et al., 1989). Mood Repair Theory proposes that sad individuals may seek emotional relief through prosocial behavior (Chiou et al., 2009; Roberts & Strayer, 1996), suggesting that sadness may possess unique potential to drive prosocial behavior (Brown, 1997; Cialdini & Kenrick, 1976).

However, alternative theories predict the opposite, arguing that sadness may inhibit prosocial behavior. Empirical research has yet to reach a consensus: some studies have observed that sadness promotes prosocial behavior (Burt & Strongman, 2005; Yang et al., 2017), while others have found inhibitory effects (Albouy, 2017), and some have suggested that the relationship is not simply linear (Carlson & Miller, 1987; Rubin et al., 2008). This inconsistency is starkly reflected in the substantial variation in correlation coefficients (r values ranging from -0.46 to 0.58) (Miller et al., 1996; Newton et al., 2014). Given these theoretical and empirical discrepancies, a systematic integration of the literature on the relationship between sadness and prosocial behavior is urgently needed.

Although existing meta-analyses have examined the relationship between self-conscious emotions (such as shame and guilt) and prosocial behavior (Guo et al., 2023; Tang et al., 2019), a systematic review of sadness—a basic emotion—and its social functions, particularly its specific manifestations in the prosocial

domain and underlying moderating mechanisms, remains lacking. Conventional meta-analyses assume independence among effect sizes, which fails to adequately address potential dependencies within or between studies (Cheung, 2019). This study innovatively employs three-level meta-analysis, a method that more precisely parses the contributions of variables at different levels and systematically examines the moderating effects of individual and contextual factors (Higgins et al., 2003; Knapp & Hartung, 2003), thereby providing more compelling evidence for clarifying the true association between sadness and prosocial behavior and identifying potential moderators based on large-scale cross-study data.

1.1 The Relationship Between Sadness and Prosocial Behavior

Current research has not reached consensus on the mechanisms explaining the relationship between sadness and prosocial behavior. Traditional perspectives argue that sadness primarily inhibits prosocial behavior through three mechanisms: the evolutionary psychological perspective emphasizes resource conservation (Gottlieb & Pancer, 1988), positing that sadness as a high-cost state prompts behavioral contraction; Negative Emotional State Theory suggests that sadness intensifies self-focus, creating "emotional tunnel vision" (Fredrickson, 2001) that reduces sensitivity to others' needs; and Gray' s Behavioral Inhibition System Theory proposes that sadness activates the BIS (Behavioral Inhibition System), decreasing behavioral motivation (Gray, 1982; Carver & White, 1994). These inhibitory effects are particularly pronounced in actor-oriented sadness (self-experienced) contexts, with research showing that sad individuals reduce sharing behavior when resources are scarce (Denham et al., 1991). Observing others' sadness may trigger resource concerns through high-cost appraisals or elicit personal distress in observers, leading to defensive avoidance (Kollmuss & Agyeman, 2002). However, these inhibitory hypotheses are not immutable laws; chronic or trait sadness often accompanies strengthened empathy and social connection, promoting prosocial behavior. Moreover, even in resource-constrained situations, some studies have found that sad individuals maintain or even increase their willingness to share (Piff et al., 2010; Small & Verrochi, 2009).

Emotion Regulation Theory, conversely, suggests that sadness can promote prosocial behavior through two distinct pathways. The Negative State Relief Model (Cialdini & Kenrick, 1976) primarily explains how actor-oriented sadness promotes helping, with emotion repair at its core—individuals improve their own emotional states by helping others, reflecting egoistic motivation consistent with Batson et al.' s (1987) view on personal distress-driven helping. Smith' s (2000) donation experiments provide empirical support for this model. The Appraisal Tendency Framework (Lerner & Keltner, 2000) posits that the core appraisal of sadness is low control, which may trigger compensatory behaviors such as social connection or assistance to restore control. Eisenberg et al.'s (1989) longitudinal research reflects this long-term effect.

Batson' s Vicarious Emotional Experience Theory further refines the promotion mechanisms by distinguishing two responses elicited by sadness: personal dis-

tress is a self-focused discomfort that drives egoistic helping (Eisenberg et al., 1989), whereas empathic concern is an other-oriented sympathy that elicits altruistic motivation (Batson, 1987). Behavioral studies by Zaki and Mitchell (2013) and neuroimaging research by Hein et al. (2016) provide biological evidence for this distinction.

Although defensive avoidance may occur in specific situations, such as when sadness is attributed to others' fault (Lockwood et al., 2014), more evidence emphasizes the universality of sadness in promoting prosocial behavior. For instance, Eisenberg et al.' s (1989) tracking data show that self-focused emotions significantly predict prosocial behavior, and Sette et al.' s (2018) research further confirms that the explanatory power of emotion regulation motivation consistently outweighs inhibitory factors.

In summary, the relationship between sadness and prosocial behavior exhibits significant divergence in both theoretical and empirical research. Single studies, limited by sampling and measurement errors (Button et al., 2013), cannot comprehensively validate theoretical frameworks. Three-level meta-analysis can integrate multiple research findings, reduce research bias (Knapp & Hartung, 2003), and quantitatively identify the mechanisms through which sadness influences prosocial behavior. This study employs this technique to test theoretical models and provide scientific evidence for emotion-driven prosocial mechanisms.

1.2.1 Developmental Stage

Research has found that the effect of sadness on prosocial behavior shows age-related differences. In early childhood, sadness negatively predicts prosocial behavior (Malti et al., 2016); during adolescence, it shifts toward enhanced compensatory tendencies (Crone & Dahl, 2012); and in adulthood, it promotes more altruistic behavior (Cutler et al., 2021). This developmental change indicates that age moderates the relationship between sadness and prosocial behavior. Based on Erikson' s (1959) Psychosocial Development Theory and Super' s (1957) Career Development Theory, this study systematically analyzes age by dividing it into five stages.

1.2.2 Gender

No consistent results have been obtained regarding whether gender differences exist in the relationship between sadness and prosocial behavior. Kemp et al. (2013) found that women showed stronger donation intentions in sad situations, whereas Stamkou et al. (2016) observed that men were more inclined to take direct supportive actions. Additionally, Hyde (2005) noted that gender differences in most psychological variables are small and highly susceptible to situational modulation. Subsequent research (Edwards et al., 2015; Tong & Wang, 2021) indicated that after controlling for social desirability and other factors, gender differences were mostly non-significant. To clarify the role of gender differences in the relationship between sadness and prosocial behavior,

this study includes participant gender as a moderator for further analysis.

1.2.3 Classification of Prosocial Behavior

The divergence in existing research on the relationship between sadness and prosocial behavior may stem from insufficient distinction between behavioral stages and types. This study integrates the Theory of Planned Behavior (Ajzen, 1991) and the Dual-System Model (Padilla-Walker & Carlo, 2014) to construct a more precise behavioral classification framework. Research shows that sadness enhances prosocial intentions, but an "intention-behavior gap" exists in the implementation stage (Grant & Gino, 2010). For example, after disaster reports, 90% of respondents express willingness to donate, yet actual donation rates fall below 50% (Weisz & Zaki, 2019). This gap is more pronounced in immediate behaviors and diminishes in delayed behaviors (Zhao et al., 2022), suggesting that sadness may have a greater impact at the intention stage.

Donation behavior, due to its low-interaction nature, is relatively stable (Nowak & Sigmund, 2005), with "sad face" fundraising advertisements during the pandemic showing high conversion rates (Liu & Aaker, 2008). In contrast, helping behavior exhibits "heart moved but no action" : sadness significantly increases helping intentions (Morelli et al., 2015), but actual behavior fluctuates considerably during interaction (Levine & Schweitzer, 2015). Dictator game studies show that sadness promotes resource allocation, but the effect disappears under anonymous conditions (Erlandsson et al., 2018; Fabes et al., 2023), indicating that the impact of sadness may vary by behavior type.

1.2.4 Types of Sadness

Based on emotional sources, trait sadness as a stable personality trait has been found to promote long-term prosocial behavior by enhancing empathic capacity (Eisenberg et al., 1989). However, some research indicates that high levels of trait sadness (especially when associated with depression and withdrawal tendencies) may inhibit daily helping behavior (Roberts & Strayer, 1996). In contrast, situationally induced sadness as a transient emotion can immediately increase individuals' helping intentions (Lerner & Keltner, 2000), such as allocating more resources in dictator games (Morelli et al., 2015). This suggests that sadness from different sources has inconsistent effects on prosocial behavior.

Furthermore, the directionality of sadness influences its effects. Research shows that recipient-oriented sadness, triggered by focusing on others' misfortune, promotes prosocial behavior through empathic responses, possibly related to mirror neuron system activation (Batson, 1987; Morelli et al., 2015). However, actor-oriented sadness, arising from focusing on one's own misfortune, directs attention more toward the self and may inhibit immediate prosocial behavior to alleviate one' s own negative emotions (Cialdini & Kenrick, 1976). Thus, whether sadness is self- or other-oriented appears to be a key factor determining whether it produces facilitative or inhibitory effects on prosocial behavior.

1.2.5 Sadness Induction Methods

Sadness induction primarily employs experimental priming (including videos, images, scenarios, texts) and self-report measures (scales, questionnaires). Among experimental methods, audiovisual stimuli (e.g., sad videos) effectively evoke empathy and increase donation intentions (Zickfeld et al., 2020), while image stimuli promote immediate helping behavior through nonverbal emotional arousal (Niu et al., 2021; Sparks et al., 2022). Scenario simulation, due to its immersive experience, has been shown to more durably enhance prosocial motivation (Fabes et al., 2023). In contrast, although text materials can also elicit empathic responses (Small & Verrochi, 2009; Zhou et al., 2020), their effects are relatively weaker and show greater individual differences. Notably, self-report measures of trait sadness often produce different or even opposite behavioral effects compared to experimentally induced state sadness (Schwartz & Loewenstein, 2017). Therefore, different induction methods may influence the relationship between sadness and prosocial behavior.

1.2.6 Sadness Assessment Methods

Sadness assessment methods can be divided into self-report (emotion scales, empathic response questionnaires) and observational measures (behavioral coding, situational observation). Self-report primarily comes from participants' self-ratings, with a small portion from parents, teachers, or researchers. This method demonstrates good validity and reliability in emotional assessment (DiBartolo & Grills, 2006) but may be affected by memory bias. In contrast, observational measures offer greater objectivity (Manucia et al., 1984). Notably, some studies using both assessment methods have found significant differences in effect sizes (Dickerson & Quas, 2021; Edwards et al., 2015). Therefore, consideration of assessment methods may influence understanding of the relationship between sadness and prosocial behavior.

1.3 Research Objectives

Given the important role of sadness and prosocial behavior in interpersonal interaction and social adaptation, clarifying their association pattern is crucial for resolving theoretical disagreements in existing research and developing social intervention strategies (Fabes et al., 2023). This study uses three-level meta-analysis to systematically examine the relationship between sadness and prosocial behavior and its potential moderating factors. Specifically, we investigate the correlation and its strength between sadness and prosocial behavior, hypothesizing that this relationship is moderated by: (1) participant characteristics (developmental stage, gender); (2) content characteristics (prosocial behavior type, sadness type); and (3) methodological characteristics (sadness induction method, sadness assessment method). By integrating existing research data, this study aims to reveal the effects of these moderating variables and provide new perspectives for understanding the complex mechanisms through which sadness drives prosocial behavior.

This study strictly follows PRISMA 2020 guidelines (Page et al., 2021) and has been preregistered on PROSPERO (registration number: CRD42024607746). All materials are publicly available on the Open Science Framework (https://osf.io/a8vw4/), ensuring research transparency.

2.1 Literature Search and Screening

Given the close etymological relationship between "sadness" and "personal distress" and their frequent interchangeable use in research (Eisenberg et al., 1989; Zhu & Li, 2005; Newton et al., 2014), to ensure comprehensive inclusion of literature on sadness and prosocial behavior, we first searched Chinese databases (CNKI, Wanfang, VIP) using keyword combinations of "悲伤" (sadness), "个人忧伤" (personal distress), "基础情绪" (basic emotion) with "亲社会行为" (prosocial behavior), "利他" (altruism), "帮助" (helping), "合作" (cooperation), "捐赠" (donation), "安慰" (consolation), and "分享" (sharing). Second, we searched English databases (Web of Science, Elsevier SD, Medline, EBSCO-ERIC, SAGE Online Journals, PsycINFO, ProQuest) using combinations of "Sadness," "Personal Distress," "Basic Emotion" with "Prosocial Behavior," "Altruis*,*" *Help*," "Cooperation," "Donat*," "Console," and "Share." The literature search covered September 1973 to May 2024, with the search completed in December 2024. A total of 19,365 articles were retrieved. After screening titles, abstracts, and full texts, combined with backward citation tracking, 41 articles were finally included (10 Chinese, 31 English), including 5 dissertations (4 master' s, 1 doctoral). Literature was imported into EndNote X9 and screened according to the following criteria: (1) studies must be empirical, excluding pure theory, reviews, and qualitative research; (2) results must report correlation coefficients (r) between sadness and total or subscale prosocial behavior scores, or convertible statistics including Cohen' s d, F, t, ^{2}, and univariate linear regression β values; (3) for experimental studies, control groups must have neutral emotions, excluding experiments with other emotions as controls; (4) literature limited to Chinese and English; (5) data must not be duplicated—if a dissertation was published as a journal article, the published version was used (Ding & Zhao, 2018); (6) participants must be healthy populations, excluding individuals with clinical conditions such as depression or anxiety. The screening process followed previous meta-analytic studies (Orth, Erol et al., 2018; Orth, Clark et al., 2021): (1) the first author conducted initial screening by quickly reviewing titles, abstracts, and keywords to exclude obviously ineligible literature; (2) the remaining 529 articles were randomly assigned to two psychology graduate students who independently read full texts and determined inclusion based on preset criteria. To assess screening reliability, Cohen' s Kappa coefficients were calculated, showing high agreement (90% and 87%). The main reason for disagreement was differential classification of control group emotion types in experimental studies. The literature screening flowchart is shown in Figure 1 [Figure 1: see original paper].

2.2 Literature Coding

Following Lipsey and Wilson (2001), we conducted coding according to predetermined standards and procedures (Table 1). Two graduate students specializing in prosocial research independently coded the 41 included articles. Coding principles included: (1) each independent sample was coded separately for effect sizes—if an article contained multiple independent samples, they were coded separately; (2) for longitudinal studies, only the first measurement was coded; (3) coded information included publication details (author and year), sample size, individualism index (based on Hofstede's (1983) cultural dimensions theory, Kappa = 1.00, data from https://www.hofstede-insights.com/country-comparison/), publication status, developmental stage (toddler, preschool, elementary school, adolescence, young adulthood), male proportion, sadness type, prosocial behavior classification, sadness induction method, sadness assessment method, and effect size. After initial coding, cross-checking was performed, with intercoder consistency measured by Cohen' s Kappa, yielding a high agreement rate of 0.93 (McHugh, 2012). Discrepancies were corrected by revisiting original articles, with subjective judgment differences resolved through discussion or re-reading.

2.3 Literature Quality Assessment

We assessed included studies using the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies provided by the National Institutes of Health (NIH). This tool comprises 14 items (e.g., whether sample size justification, statistical power description, or variance and effect size estimates were provided). Studies were scored as meeting (1 point) or not meeting (0 point) each criterion (Zhu et al., 2024). Quality ratings were: good (>7 points), fair (5–7 points), and poor (<5 points). Two researchers independently assessed literature quality, with results available on the Open Science Framework (https://osf.io/a8vw4/).

2.4 Effect Size Calculation

This study used Pearson' s correlation coefficient (r) as the effect size metric. Specific procedures were: (1) extract or calculate each reported correlation between sadness (or its subtypes) and different types of prosocial behavior; (2) convert experimental group Cohen' s d to r; (3) if studies only reported independent samples t-test t values, chi-square ^{2} values, or one-way ANOVA F values, convert them using the following formulas before coding: [r = ^{2} + N ; r = t2+ df ; r = F + dfe ; r= $\beta \times 0.98 + 0.05$ (β\$ \$0); r = $\beta \times 0.98$ ($\beta <$ 0)(β (-0.5,0.5))] (Card, 2012; Peterson & Brown, 2005). To approximate normal distribution, we first performed Fisher' s Z transformation on correlation coefficients r in R, then converted z values back to r values for interpretation. A total of 70 effect sizes were obtained, with included literature information openly accessible (https://osf.io/a8vw4/).

2.5 Model Selection

Traditional meta-analysis assumes independence among effect sizes, creating challenges when handling multiple effect sizes from the same study (Assink & Wibbelink, 2016). In this study, original articles often generated multiple effect sizes through multiple measurement instruments, multiple outcome variables, or multi-timepoint data (Lipsey & Wilson, 2001). These effect sizes are not independent, sharing within-study variance sources (Cheung, 2019). Conventional approaches of averaging or randomly selecting single effect sizes not only waste valuable data and reduce statistical efficiency (Gao et al., 2017) but more critically, fail to distinguish whether effect size variation stems from measurement differences, different outcome indicators, or between-study factors such as research design or sample characteristics. This severely limits our ability to understand the sources of heterogeneity in the "facilitative" and "inhibitory" effects within the complex relationship between sadness and prosocial behavior.

To overcome these limitations and effectively address the core controversy of this study, we adopted three-level meta-analysis. This method decomposes total variance into sampling variance (Level 1), within-study variance (Level 2), and between-study variance (Level 3). Compared to traditional meta-analysis, this approach not only precisely identifies specific sources of heterogeneity through multilevel analysis but also resolves limitations of the independence assumption by including all effect sizes from the same study (Raudenbush & Bryk, 2002), thereby increasing statistical power (Assink & Wibbelink, 2016). This is crucial for detecting the subtle effects of sadness on prosocial behavior and its moderating effects.

2.6 P-Curve Analysis

P-curve analysis examines the distribution characteristics of p-values in published studies to assess result reliability (Simonsohn et al., 2014), aiming to distinguish true effects from publication bias or p-hacking (e.g., selective outlier exclusion, flexible data collection termination, or covariate inclusion criteria). The method is based on the principle that studies with true effects (H1 true) tend to produce highly significant results ($p < 0.025$) rather than marginally significant results ($0.025 < p < 0.05$), resulting in a right-skewed p-value distribution. Conversely, studies with null effects (H1 false) produce a flat p-curve, indicating lack of evidential value. P-curve analysis uses two main tests: (1) Binomial Test, comparing proportions of $p < 0.025$ versus $p > 0.025$; and (2) Continuous Test, calculating pp values (probability of obtaining the p-value under null hypothesis, pp = p / 0.05) and testing right skewness via Stouffer' s method.

2.7 Publication Bias Control and Assessment

Publication bias refers to published literature not systematically representing the complete body of completed research in a field (Rothstein et al., 2005), which

can overestimate the true average effect size and compromise meta-analytic reliability (Wolfgang et al., 2007). To effectively control publication bias, this study included both published journal articles and unpublished dissertations. We used funnel plots, Egger' s regression, and trim-and-fill methods for quantitative and qualitative assessment. A symmetric inverted funnel shape indicates minimal publication bias (Rothstein, 2006). Egger' s regression $p > 0.05$ suggests no significant bias (Egger et al., 1997). If trim-and-fill results remain significant with minimal value change, the meta-analysis is considered robust against publication bias (Duval & Tweedie, 2000).

2.8 Sensitivity Analysis

The included studies reported sadness-prosocial behavior correlations ranging from -0.46 to 0.58, suggesting large result differences. This indicates that the meta-analytic results may be influenced by outlier effect sizes, leading to spurious statistical conclusions (Kepes & Thomas, 2018). To assess outlier impact and ensure robust conclusions, we conducted sensitivity analysis using the leave-one-out method (Dodell-Feder & Tamir, 2018). First, we removed each effect size individually and re-ran the three-level meta-analysis until all effect sizes had been removed once, to gauge outlier impact. Second, we removed each original study individually and re-ran the analysis to examine the impact of outlier studies.

2.9 Data Processing

This study used correlation coefficient r as the effect size indicator, conducting meta-analytic calculations, publication bias assessment, main effect testing, and moderation analysis using the Metafor package (Viechtbauer, 2010) in R X64 4.1.1-win. We adapted R syntax following tutorials by Assink and Wibbelink (2016) and Rodgers and Pustejovsky (2021). For moderation analysis, following Card (2012), we ensured each moderator level had at least 5 effect sizes to represent that level adequately.

3.1 Main Effect Test

The main effect size for the sadness-prosocial behavior relationship was significant ($r = 0.13$, 95% CI [0.08, 0.18]). According to guidelines for interpreting correlation magnitude (Gignac & Szodorai, 2016), the correlation strength falls between 0.10–0.20, indicating a low positive correlation (see Table 2). Influence analysis revealed no outliers (see supplement). Sensitivity analysis on the 70 effect sizes using the leave-one-out method showed that the pre-removal main effect was 0.13 (95% CI [0.08, 0.18]), while the 70 post-removal main effects fluctuated between 0.12–0.14, with minimal change in effect values and unchanged significance. These results indicate that the meta-analytic findings are robust and reliable.

3.2 Heterogeneity Test

We conducted heterogeneity tests to determine the appropriateness of random-effects models and the necessity of moderation analysis. Results showed: Qb (69) = 258.97, $p < 0.001$, $I^2 = 76.50\%$ (see Table 2). This exceeds Higgins et al.' s (2003) interpretation threshold, indicating that 76.50% of variance is due to true differences among effect sizes. Therefore, using random-effects models for subsequent analyses is appropriate. Moreover, this suggests that between-study differences may be influenced by study characteristics, making it reasonable to explore moderating variables affecting the relationship.

3.3 Publication Bias Assessment

First, we examined publication bias via funnel plot (Figure 2 [Figure 2: see original paper]), with Fisher' s Z on the x-axis and standard error on the y-axis. The plot shows effect sizes are evenly distributed in the upper middle region and on both sides of the overall effect, visually indicating no severe publication bias. For more precise assessment, we conducted Egger' s regression using both two-level and three-level models for comparison. Results showed no significance for either Egger' s (two-level) t = 1.55, b = 0.04, 95% CI [-0.07, 0.16], p = 0.126 ($p > 0.05$) or Egger' s (three-level) t = 1.43, b = 0.11, 95% CI [-0.04, 0.26], p = 0.773 ($p > 0.05$).

Furthermore, we applied Duval and Tweedie' s (2000) trim-and-fill method to assess publication bias impact. After trimming and filling 3 missing values on the left, the overall effect remained significant using random-effects models (pre-trim: $p < 0.001$, r = 0.13; post-trim: $p < 0.001$, r = 0.12), with minimal value change, indicating negligible publication bias and reliable overall effect estimation.

3.4 P-Curve Analysis Results

P-curve analysis of the sadness-prosocial behavior relationship revealed a significantly right-skewed distribution (Binomial test: p = 0.0007; Continuous test: z = -8.22, $p < 0.001$). Among the 33 significant p-values, 26 were below 0.025 (see Figure 3 [Figure 3: see original paper]). These results indicate that the meta-analytic findings reflect a true effect of the sadness-prosocial behavior relationship rather than being artifacts of publication bias or p-hacking.

3.5 Moderation Analysis

Moderation analysis of the random-effects model revealed no significant effects for sadness induction method F(6, 63) = 0.94, p = 0.470, sadness assessment method F(1, 68) = 0.02, p = 0.892, sadness type F(1, 68) = 0.12, p = 0.729 and F(1, 68) = 1.24, p = 0.269, prosocial behavior classification F(5, 64) = 0.81, p = 0.545 and F(1, 68) = 1.06, p = 0.307, publication type F(1, 68) < 0.001, p = 0.988, male proportion F(1, 68) = 3.05, p = 0.085, or individualism index F(1,

68) = 0.47, p = 0.497. However, developmental stage showed significant moderation, F(4, 65) = 3.81, p = 0.007. Specifically, young adulthood (r = 0.19, p < 0.001) showed stronger correlations with prosocial behavior than toddlerhood (r = 0.02, p = 0.630), preschool (r = 0.11, p = 0.013), elementary school (r = 0.09, p = 0.123), and adolescence (r = 0.17, p = 0.008) (see Table 3).

4.1 The Relationship Between Sadness and Prosocial Behavior

Using three-level meta-analysis, this study quantitatively integrated 41 articles (k = 70, N = 10,173) spanning nearly 50 years, finding a weak but statistically significant positive correlation between sadness and prosocial behavior (r = 0.13, 95% CI [0.08, 0.18]). This result challenges the traditional view that sadness necessarily inhibits prosocial behavior (Gottlieb & Pancer, 1988; Fredrickson, 2001; Gray, 1982) and provides support for the perspective that sadness can promote prosocial behavior (Cialdini & Kenrick, 1976; Lerner & Keltner, 2000; Batson, 1987; Eisenberg et al., 1989).

Specifically, Emotion Regulation Theory' s Negative State Relief Model and Appraisal Tendency Framework jointly explain this facilitative effect: the former reveals egoistic helping motives driven by emotion repair (Cialdini & Fultz, 1990), while the latter clarifies compensatory social connection needs triggered by low control (Lerner & Keltner, 2000). Notably, these mechanisms are not mutually exclusive but may operate simultaneously, with the 叠加效应 of dual motives potentially contributing to the weak effect size. Additionally, Batson' s Vicarious Emotional Experience Theory enriches understanding by emphasizing that sadness drives not only egoistic motives for emotion repair (Eisenberg et al., 1989) but also altruistic motives based on empathic concern (Batson, 1987).

The study found that whether actor-oriented or recipient-oriented, whether transient situational sadness or relatively stable trait sadness, all showed positive associations with prosocial behavior (though trait sadness studies were relatively few, potentially affecting conclusion robustness), indicating that sadness indeed has a facilitative tendency. However, sadness' s prosocial effect was significantly weaker than guilt (r = 0.36) and shame (r = 0.22) (Guo et al., 2023; Tang et al., 2019). This difference may stem from distinct emotional motivational mechanisms: guilt and shame as self-attributional emotions have relatively singular, clear compensatory and reparative motives (Tangney & Fischer, 1995; Nelissen & Zeelenberg, 2009), whereas sadness, often triggered by external loss or others' distress, presents more diverse psychological pathways (Cialdini & Fultz, 1990; Lerner & Keltner, 2000; Batson, 1987). This interaction of multiple motives makes sadness' s facilitative effect on prosocial behavior "ubiquitous but limited in strength and context-sensitive." In conclusion, this study not only reveals the complex mechanisms through which sadness promotes prosocial behavior but also emphasizes the conditional nature of its effects. These findings offer important practical implications: intervention should focus on creating favorable conditions, such as providing clear, low-cost helping opportunities,

ensuring resource security, and guiding sad experiences toward positive social connection orientations.

4.2.1 Developmental Stage

Developmental stage significantly moderated the sadness-prosocial behavior relationship. Correlations showed a nonlinear trend from toddlerhood (r = 0.02) to young adulthood (r = 0.19), peaking in young adulthood. Early childhood' s immature emotional cognition often elicits self-centered responses to sadness (Malti et al., 2016). With age, adolescent identity exploration intertwined with career cognition enhances prosocial behavior through synergistic "helping others helps oneself" motives and emotional sensitivity (Crone & Dahl, 2012). Young adulthood' s integration of moral cognition and empathic capacity facilitates intention-behavior consistency (Cutler et al., 2021). Compared to shame, young adults' sadness shows neural and functional similarities to guilt (Bastin et al., 2016; Morelli et al., 2015), highlighting dynamic covariation between moral emotions and cognitive control systems. However, the predominance of young adult samples limits interpretive power for other stages. The lack of middle-aged and elderly samples affects comprehensive understanding of lifespan patterns, warranting future research with balanced samples.

4.2.2 Gender

Gender showed no significant moderating effect on sadness-induced prosocial behavior, suggesting a cross-gender convergence effect. This aligns with meta-analyses on related topics (Guo et al., 2023; Tang et al., 2019) and Miller et al. (1996). Kemp et al. (2013) and Stamkou et al. (2016) noted that gender differences may manifest more in specific behavioral expressions, such as helping strategies and motivational depth, rather than overall behavior levels.

4.2.3 Prosocial Behavior Classification

Sadness' s facilitative effect was not significantly moderated by behavior type or implementation stage, supporting Emotional Compensation Theory—that sadness universally promotes sharing, donation, and other helping behaviors by motivating negative emotion repair (Chiarella & Poulin-Dubois, 2015; Edwards et al., 2015). For instance, sad groups showed significantly higher willingness to share cookies and donate money than control groups, with minimal differences (Tangney & Fischer, 1995).

However, this "universality" conclusion may stem from methodological limitations, as studies failed to effectively distinguish high- versus low-cost behaviors or public versus anonymous contexts. Measurement coarseness may mask potential moderating effects, resulting in statistically "non-significant differences" (Cryder et al., 2013).

The non-significant stage moderation also requires cautious interpretation. The meta-analysis found no significant difference between sadness' s effects on help-

ing intentions versus behavioral implementation, possibly because sadness simultaneously enhances intentions and reduces behavioral barriers through an "empathy-motivation" pathway (Batson et al., 2015; Grant & Gino, 2010). However, existing research focuses more on immediate intentions than delayed behaviors (Van Kleef & Lelieveld, 2022), failing to capture self-efficacy and situational constraints in the intention-behavior transition (Eisenberg et al., 1989), potentially averaging out true stage differences.

4.2.4 Sadness Type

Neither sadness source (trait vs. situational) nor directionality (actor vs. recipient) significantly moderated the relationship. Trait and state sadness showed equivalent effects, consistent with Eisenberg et al. (1989), suggesting shared emotional activation mechanisms. However, methodological differences may mask trait sadness' s long-term effects (Morelli et al., 2015). The non-significant directionality moderation indicates that both self-experienced and observed sadness promote helping, aligning with Batson' s (1987) theory of different but equivalent helping pathways.

4.2.5 Sadness Induction Methods

Induction method showed no significant moderation, possibly related to individuals' emotion regulation capacity (Gross & Barrett, 2011). After sadness induction via video or images, individuals regulate emotions through cognitive reappraisal, showing similar helping behavior (Hatfield et al., 2011). A "missed farewell" story experiment supported this: story and video groups differed in sadness intensity but showed no significant differences in prosocial behaviors like actively comforting strangers or providing contact information (Morelli et al., 2015). Note that subgroup analysis followed strict criteria (Card, 2012), excluding subgroups with fewer than 5 effect sizes (scenario paradigm, recall, and imagination induction). Whether the relationship is affected by less common induction methods requires further verification.

4.2.6 Sadness Assessment Methods

Assessment method showed no significant effect, possibly due to convergence in capturing sadness characteristics across methods. Although self-report and observational measures differ in assessment dimensions and tools, both effectively identify sadness features, resulting in similar patterns when evaluating prosocial behavior and suggesting that assessment method is not a critical factor (Cialdini & Kenrick, 1976).

Overall, except for significant heterogeneity in developmental stage moderation, other moderators (including individualism index and publication status) showed no significant effects, indicating that sadness' s impact on prosocial behavior is relatively stable.

4.3 Limitations and Future Directions

This study has several limitations that also suggest future research directions. First, regarding emotion types, this study focused on sadness as a basic emotion and attempted preliminary comparison with self-conscious emotions (shame, guilt). Limited by available literature, we could not establish a systematic cross-emotion comparison model. Future research should construct more refined emotion functional classification frameworks (Chiarella & Poulin-Dubois, 2015; Dickerson & Quas, 2021). Second, the low proportion of longitudinal studies limits examination of long-term relationships. Future research should adopt multi-wave designs with extended follow-up periods to investigate delayed effects (Schwartz & Loewenstein, 2017). Finally, regarding sample representativeness, trait sadness studies were few (11 studies), making it difficult to distinguish state versus trait effects; cross-cultural samples were imbalanced (Western samples accounted for 74.29%), limiting generalizability; and middle-aged and elderly populations were lacking. Future research should increase trait sadness studies, optimize cultural sample structures, and expand age ranges (Sette et al., 2018).

In conclusion, this meta-analysis demonstrates a weak but significant positive correlation between sadness and prosocial behavior, particularly pronounced in young adulthood. This relationship is not significantly affected by prosocial behavior type or sadness induction method, suggesting good cross-situational consistency.

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