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# The Bidirectional Relationship between Rumination and Self-Esteem: Evidence from Longitudinal Tracking and Diary Methods

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Rumination and self-esteem are pivotal in mental health research. Existing studies indicate that there is an association between rumination and self-esteem, however, there is a lack of evidence for bidirectional influences. This study employed longitudinal and diary methods to investigate their bidirectional influences. The initial phase involved a two-wave survey, conducted over a year, with 1157 participants to examine the bidirectional predictive relationship between rumination and self-esteem. Cross-Lagged Panel Model (CLPM) indicated that baseline rumination could forecast subsequent self-esteem levels, and vice versa. To reduce recall bias, the second phase involved a 28-day diary study with 185 participants, revealing that daily fluctuations in rumination could predict the following day's self-esteem, and similarly, daily self-esteem levels could predict the next day's rumination. This research elucidates the bidirectional influences between rumination and self-esteem, introducing a bidirectional spiral ascension model. This model holds significant theoretical implications for mental health research.

*Key words:* rumination, self-esteem, longitudinal tracking method, diary method

## Introduction

Rumination and self-esteem are crucial in understanding mental health and well-being, and are integral to addressing psychological disorders. Rumination, defined as a repetitive, passive cognitive process, involves a persistent focus on the symptoms, causes, and consequences of psychological distress. Characterized by continuous self-reflection and concern, it is often linked with negative emotions and cognitive patterns, such as incessant preoccupation with worries and problems,

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leading to a feeling of entrapment (Barba et al., 2022). Research demonstrates its association with various mental health issues, particularly depression and anxiety (Olatunji et al., 2013; Riley et al., 2019). Rumination not only aggravates existing psychological distress but also contributes to the persistence and recurrence of mental health problems (Treynor et al., 2003; Nolen-Hoeksema et al., 2008; Spasojević et al., 2001). Conversely, self-esteem, the overall evaluation of one's worth and abilities, is linked with positive emotional states, life satisfaction, and overall well-being when high, and with psychological disorders like depression, anxiety, and social phobia when low (Harris et al., 2020; Orth et al., 2014). Self-esteem not only shapes self-perception but also influences resilience and coping mechanisms in the face of life's stressors and challenges (Barba et al., 2022).

Existing research underscores a bidirectional relationship between rumination and self-esteem. At the trait level, their interrelation is evident (Eikey et al., 2021), and they have been shown to predict each other over time (Calvete et al., 2015). Additionally, numerous studies employing questionnaires and experience sampling methods have identified within-individual correlations between rumination and self-esteem at the state level (Lennarz et al., 2019; Li et al., 2017; Pasyugina et al., 2015). Specifically, persistent rumination can erode an individual's self-esteem, leading to adverse evaluations of self-worth and abilities, thereby heightening the risk of psychological distress and mental health issues. According to the response style theory, rumination diminishes self-esteem and intensifies depressive symptoms. Those with lower self-esteem tend to ruminate in response to negative emotions, creating a detrimental cycle that further diminishes self-esteem (Nolen-Hoeksema, 1991). Moreover, the self-discrepancy theory suggests that individuals are aware of their actual, ideal, and ought selves. Emotional vulnerability is linked to discrepancies among these self-states. Rumination on these discrepancies can aggravate feelings of low self-worth and perceived failure (Higgins, 1987). Research indicates that rumination predicts a decline in self-esteem over time, suggesting its temporal contribution to the erosion of self-esteem (Lennarz et al., 2019; Kuster et al., 2015). In clinical practice, rumination is a prevalent characteristic among individuals with depression and anxiety disorders and is inversely related to self-esteem levels (Watkins & Moulds, 2005). Therefore, we propose the hypothesis that:

H1: Rumination at the baseline negatively predicts self-esteem at follow-up.

H2: Rumination on the previous day negatively predicts self-esteem on the following day.

Conversely, low self-esteem may predispose individuals to rumination, as they are often more inclined to dwell on personal failures, flaws, and problems. Kernis' research reveals that individuals with low self-esteem are more susceptible to rumination in response to stress or failure, engaging in negative self-referential processing. This creates a harmful cycle of persistent low self-esteem and chronic rumination (Kernis, 2003). Leary and Baumeister (2000) introduced the sociometer theory, positing that self-esteem serves as an internal monitor of social acceptance. Perceived threats to social value lead to low self-esteem and consequent rumination as a means to process and cope with these threats (Leary et al.,2000). In clinical settings, Roberts and his team demonstrated that interventions aimed at enhancing self-esteem could reduce the frequency and intensity of rumination. This finding indicates that bolstering self-esteem may be an effective approach to mitigate rumination and its negative implications (Roberts & Monroe, 1994). Therefore, we propose the hypothesis that:

H3: Self-esteem at the baseline negatively predicts rumination at follow-up.

H4: Self-esteem on the previous day negatively predicts rumination on the following day.

While the relationship between rumination and self-esteem has garnered increasing attention, significant gaps remain in this research area. Firstly, most prior studies have relied on cross-sectional data, limiting insights into the bidirectional influences relationship between rumination and self-esteem. To address this, Study 1 is designed to investigate their long-term bidirectional influences relationship through a two-wave tracking approach with a one-year interval. This longitudinal design aims to provide deeper insights into the temporal dynamics and bidirectional influences between these two constructs. Secondly, the measurement of rumination and self-esteem in existing research often depends on retrospective self-reports, which are susceptible to recall bias. The diary method offers a solution to this issue by minimizing recall bias and enhancing the ecological validity of the research. Consequently, Study 2 will employ the diary method to examine the short-term bidirectional influences relationship between rumination and self-esteem. In summary, this study integrates long-term tracking (Study 1) and the diary method (Study 2) to comprehensively investigate the bidirectional influences relationship between rumination and self-esteem in adults.

## Study 1
## The Impact of Rumination on Self-Esteem: Evidence from Tracking Method

Study 1 utilized a two-wave tracking method to investigate the long-term bidirectional influences relationship between rumination and self-esteem.

### Participants and Procedures

A total of 1423 participants were recruited from a university in Hangzhou, China, and they were followed up with two waves of surveys spaced one year apart. At the first time point (T1), 1410 samples were collected. A year after the first time point (T1), the subjects were retested. After excluding losses, missing answers, and repeated responses, the final valid number of subjects was 1157, with an effective questionnaire retrieval rate of 81.3%. In this study, the average age of participants was 19.30 years, with a standard deviation of 1.30. Among them, there were 440 males and 717 females. We used G*power 3.1 software (Faul et al., 2007) to estimate the sample size of this study. With $\alpha = 0.05$, a correlation effect size $r = 0.20$, and aiming for 80% statistical power, at least 193 participants were needed. The sample size used in this study meets this requirement.

### Measures

*Rumination Questionnaire*

The Ruminative Responses Scale (RRS), developed by Nolen-Hoeksema and others and revised by Han Xiu and Yang Hongfei, was used to measure participants' rumination. The revised scale consists of 22 items. The split-half reliability of this revised scale is 0.95, and the test-retest reliability is 0.74, indicating that the revised Chinese version of the scale has good reliability and validity (Han & Yang, 2009). The scale uses a 4-point scoring system from 1 (never) to 4 (always), with higher total scores indicating higher levels of rumination. In this study, the McDonald's omega coefficients of the scale at the two time points were 0.88 and 0.90, respectively.

*Self-Esteem Scale*

The Self-Esteem Scale (SES), developed by Rosenberg and adapted by domestic scholars such as Wang Ping, was used. The split-half reliability of the revised Chinese version of the scale is 0.96, and the test-retest reliability is 0.72, indicating good reliability and validity of the revised Chinese version (Wang et al., 1998). The revised Chinese version uses a four-point scoring system and includes 10 items, with items 5, 7, 9, and 10 being reverse-scored. Higher total scores indicate higher levels of self-esteem. In this study, the McDonald's omega coefficients of the scale at the two time points were 0.87 and 0.90.

**Statistical Analysis**

Study 1 utilized SPSS 25.0 and Mplus 8.0 for data analysis. First, a test of longitudinal measurement invariance is conducted. In psychometrics, measurement invariance (MI) refers to the consistency of the results obtained by a measurement tool when assessing the same psychological construct under different contexts (Putnick & Bornstein, 2016). Measurement invariance across different time points is known as longitudinal invariance (Liu et al., 2017). This study intends to employ confirmatory factor analysis (CFA) to test for invariance. The measurement invariance is assessed using ΔCFI and ΔRMSEA; when $|\Delta CFI| \leq 0.01$ and $|\Delta RMSEA| \leq 0.015$, it indicates no significant differences between the two models (Chen, 2007). Subsequently, descriptive statistics and correlational analyses are conducted (as shown in Table 1). Finally, based on the results of the correlational analysis, Cross-Lagged Panel Model (CLPM) was performed using Mplus 8.0. Four structural equation models were established to explore the relationship between trait rumination and self-esteem (as illustrated in Figure 1).

Model 1 is the baseline model (M1), an autoregressive model controlling for covariates (age and gender), which examines the temporal stability of the main variables. Model 2 is the forward model (M2). This model, building upon M1, includes the cross-lagged path from rumination at T1 to self-esteem at T2, exploring whether rumination at T1 predicts self-esteem at T2. Model 3 is the reverse model (M3), which, based on M1, adds the cross-lagged path from self-esteem at T1 to rumination at T2, examining whether self-esteem at T1 can predict rumination at T2. Finally,

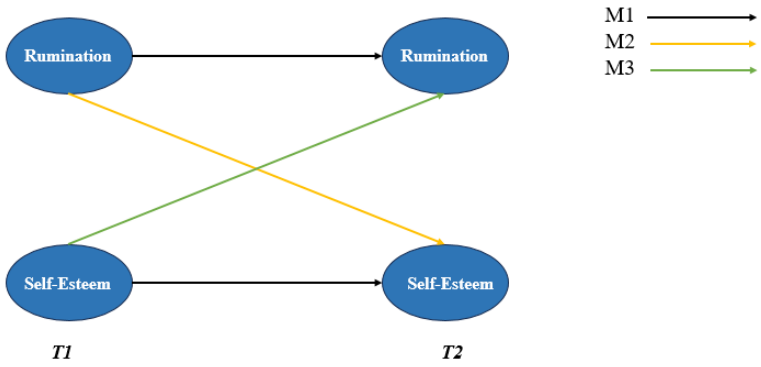


*Figure 1* Cross-lagged model of rumination and self-esteem.

there is the bidirectional model (M4), which includes both autoregressive and all cross-lagged paths, examining the bidirectional causal relationship between rumination and self-esteem.

## Results

The results of the CFA indicate that the model fit meets the required criteria at both time points (T1: CFI = 0.93, TLI = 0.92, RMSEA = 0.07; T2: CFI = 0.94, TLI = 0.93, RMSEA = 0.08). The longitudinal measurement invariance for self-esteem and rumination is established.

Table 1 lists the means, standard deviations, and correlation matrices of the main variables at the two time points. The results revealed a significant negative correlation between rumination and self-esteem at both time points, consistent with the expectations of the study. Next, we examined the autoregressive and cross-lagged models of rumination and self-esteem. The autoregressive model M1 fit the actual data well (as shown in Table 2). In this model, the stability coefficients for both rumination and self-esteem were significant, indicating that the variables remained relatively stable over time (as shown in Table 3).

The forward model M2 also demonstrated good model fit. Compared to M1, M2 showed better fit: $\Delta\chi^2 = 28.60$, $p < 0.001$. The path coefficient from T1 rumination to T2 self-esteem was significant ($\beta = -0.25$, $p < 0.001$), indicating that trait rumination can negatively predict self-esteem.

The reverse model M3 also showed good fit. Compared to M1, M3 had a better fit: $\Delta\chi^2 = 23.93$, $p < 0.001$. There was a predictive effect of T1 self-esteem on T2 rumination ($\beta = -0.21$, $p < 0.001$), suggesting that self-esteem can negatively predict rumination.

The bidirectional model M4 also had a good fit. Furthermore, compared to M1, M4 showed a better fit: $\Delta\chi^2 = 31.14$, $p < 0.001$.

Table 1 *Means, standard deviations, and correlation matrix of rumination and self-esteem*

| Variable | *M* | *SD* | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| 1. T1 Rumination | 44.38 | 6.92 | 1 | | | |
| 2. T1 Self-esteem | 21.08 | 4.53 | -0.31** | 1 | | |
| 3. T2 Rumination | 48.20 | 7.13 | 0.43** | -0.26** | 1 | |
| 4. T2 Self-esteem | 22.51 | 4.60 | -0.29** | 0.38** | -0.55** | 1 |

*Note.* T1 and T2 represent two measurement time points.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 2 *Fit indices of the model*

| Model | $\chi^2$ | *p* | RMSEA | SRMR | CFI | TLI | Model comparison | $\Delta\chi^2$ | *p* |
|---|---|---|---|---|---|---|---|---|---|
| M1 | 828.38 | < .001 | 0.08 | 0.09 | 0.90 | 0.90 | | | |
| M2 | 799.78 | < .001 | 0.07 | 0.08 | 0.91 | 0.90 | M1−M2 | 28.60 | < .001 |
| M3 | 804.45 | < .001 | 0.08 | 0.08 | 0.90 | 0.90 | M1−M3 | 23.93 | < .001 |
| M4 | 797.24 | < .001 | 0.07 | 0.07 | 0.92 | 0.91 | M1−M4 | 31.14 | < .001 |

*Note.* RMSEA: Root Mean Square Error of Approximation; SRMR: Standard Root Mean Square Residual; CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; According to the fit index judgment criteria recommended by Hu and Bentler (1998), a model is considered to have a good fit if RMSEA < 0.08, SRMR < 0.10, CFI > 0.90, and TLI > 0.90 (Hu & Bentler, 1998).

Table 3 *Table of standardized stability and cross-lagged coefficients*

| Model | Autoregressive paths | *β* | 95% CI | Cross-lagged paths | *β* | 95% CI |
|---|---|---|---|---|---|---|
| M1 | T1 Rumination→T2 Rumination | 0.36*** | [0.30, 0.42] | | | |
| | T1 Self-esteem→T2 Self-esteem | 0.33*** | [0.25, 0.37] | | | |
| M2 | T1 Rumination→T2 Rumination | 0.42*** | [0.34, 0.49] | T1 Rumination→T2 Self-esteem | -0.25*** | [-0.29, -0.12] |
| | T1 Self-esteem→T2 Self-esteem | 0.36*** | [0.29, 0.39] | | | |
| M3 | T1 Rumination→T2 Rumination | 0.32*** | [0.24, 0.40] | T1 Self-esteem→T2 Rumination | -0.21*** | [-0.22, -0.18] |
| | T1 Self-esteem→T2 Self-esteem | 0.40*** | [0.34, 0.50] | | | |
| M4 | T1 Rumination→T2 Rumination | 0.41*** | [0.33, 0.48] | T1 Rumination→T2 Self-esteem | -0.18*** | [-0.26, -0.10] |
| | T1 Self-esteem→T2 Self-esteem | 0.31*** | [0.24, 0.41] | T1 Self-esteem→T2 Rumination | -0.16** | [-0.24, -0.09] |

*Note.* $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Compared to M3, M4 had a better fit: $\Delta\chi^2$ = 7.21, $p < 0.001$. T1 rumination could negatively predict T2 self-esteem ($\beta$ = -0.18, $p < 0.001$), and T1 self-esteem could negatively predict T2 rumination ($\beta$ = -0.16, $p$ = 0.002). To compare the effects of two paths, we conducted a Bootstrap test and found that $\Delta\beta$ = 0.02, with a *95% CI* of [-0.009, 0.005], indicating non-significance. This result suggests that there is no significant difference between the effect of T1 rumination predicting T2 self-esteem and the effect of T1 self-esteem predicting T2 rumination.

In summary, the results of Study 1 indicate that rumination at Time 1 (T1) negatively predicted self-esteem at Time 2 (T2), and self-esteem at T1 negatively predicted rumination at T2. Therefore, there exists a long-term reciprocal predictive relationship between rumination and self-esteem, with no difference in the predictive effects.

## Study 2
## The Impact of Rumination on Self-Esteem: Evidence from Diary Method

To avoid recall bias, Study 2 employed the diary method to further examine the short-term predictive relationship between rumination and self-esteem.

### Participants and Procedures

Study 2 recruited 210 participants from a university in Wuhan for a 28-day diary study. A total of 185 participants (77 males and 108 females) with an average age of 19.92 ± 1.48 years provided valid data. Throughout the 28 days of survey completion, 5157 valid data entries were collected, with 23 missing values due to participants not completing the daily entries for personal reasons. Missing values were handled using Full Information Maximum Likelihood estimation. The minimum

sample size was calculated using Monte Carlo simulation analysis in the R package 'simr' (Arend & Schäfer, 2019). The results indicated that, for an intragroup effect ($\gamma$10.std = 0.10, ICC = 0.50), to achieve a statistical power of 0.85 ($\alpha$ = 0.05), 141 participants (3948 data entries) were needed over the 28-day tracking. Hence, the sample size used in Study 2 met the requirements.

The study utilized the WeChat platform for distributing and collecting questionnaires. Before the official start of the study, participants were asked to complete demographic information (such as gender and age). During the 28-day diary survey, daily questionnaire links were sent at 6 PM every day, asking participants to assess their rumination and self-esteem for that day, with the questionnaire link closing at midnight. The next morning at 9 AM, the questionnaire link was resent to those who had not completed it, asking them to assess their state from the previous day, with the questionnaire closing at noon.

**Measures**

*Daily Rumination*

Following Bolger et al.'s questionnaire adaptation method and to reduce participant burden, three items with the highest factor loadings from the rumination scale used in Study 1 were selected and adapted to measure participants' daily level of rumination (Bolger et al., 2003) (specific content available in the Online Supplement 1). In this study, the within- and between-subject omega coefficients for this scale were 0.82 and 0.86, respectively.

*Daily Self-Esteem*

The self-esteem scale from Study 1 was modified to be suitable for the diary method. Three items with the highest factor loadings were selected and adapted to measure daily self-esteem (specific content available in the Online Supplement 1). In this study, the within- and between-subject omega coefficients for this scale were 0.81 and 0.90, respectively.

**Statistical Analysis**

Given that the daily observational data in this study were nested within participants, the research data comprised two levels: Between-group level and Within-group level. Considering that the dataset falls into the category of intensive longitudinal data, dynamic structural equation modeling (DSEM) is an excellent tool for handling such data. This study used Mplus 8.0 to construct DSEM.

The first step involved conducting multilevel confirmatory factor analysis on the adapted scales to ascertain their structural validity after adaptation. Next, a null model without predictive variables was established to estimate means, within- and between-group variances, within- and between-group correlations, and the intraclass correlation coefficient (ICC). This model helped to determine the proportion of variance that resides within and between individuals. Finally, to further examine the relationship between rumination and self-esteem, DSEM was employed to construct autoregressive models and cross-lagged path models. (Details of the model construction process are available in the Online Supplement 2).

## Results

**Structural Validity and Descriptive Statistics**

Given that traditional factor analysis methods may violate assumptions of randomness and independence in the sample, multilevel confirmatory factor analysis was conducted on daily rumination and daily self-esteem. In this

model, both within-group and between-group included latent variables for rumination and self-esteem. The results indicated good model fit: $\chi^2$ = 624.61, *CFI*= 0.92, *TLI* = 0.90, *RMSEA* = 0.07, $SRMR_{(within)}$ = 0.05, $SRMR_{(between)}$ = 0.08. Thus, the measures for daily rumination and daily self-esteem demonstrated good structural validity.

Table 4 presented the means, SD, within- and between-group variances, intraclass correlation coefficients (ICC), and within- and between-group correlations for rumination and self-esteem. The results showed that the within-group ICC for rumination was 0.59 and for self-esteem was 0.62, indicating that 41% of the variability in rumination and 38% in self-esteem were due to within-group differences. Therefore, the research data were suitable for two-level analysis (Zhang et al., 2003). Within-group correlation analysis indicated a significant correlation between rumination and self-esteem (r = 0.38), suggesting that higher levels of rumination on a given day were associated with higher self-esteem for the participant on that day.

**Multilevel Lagged Effect Regression Analysis**

To further examine the relationship between rumination and self-esteem, we constructed a multilevel regression model with rumination as the independent variable and self-esteem as the dependent variable. The model showed that rumination predicted individual self-esteem ($\gamma$ = 0.61, *SE* = 0.04, *t* = 12.95, $p < 0.001$). Additionally, this result remained significant after controlling for time factors ($\gamma$ = 0.59, *SE* = 0.03, *t* = 13.24, $p < 0.001$).

The results of the multilevel cross-lagged path analysis indicated that rumination from the previous day predicted rumination on the following day ($\gamma$ = 0.21, *SE* = 0.08, $p < 0.001$), and self-esteem from the previous day predicted self-esteem on the following day ($\gamma$ = 0.17, *SE* = 0.03, $p < 0.001$). This demonstrates that both rumination and self-esteem showed high within-individual stability over the shorter period of 28 days, suggesting that once individuals exhibit higher levels of rumination and self-esteem, these tendencies are likely to continue to some extent.

Furthermore, rumination from the previous day predicted self-esteem on the following day ($\gamma$ = 0.14, *SE* = 0.04, $p < 0.01$), and self-esteem from the previous day predicted rumination on the following day ($\gamma$ = 0.04, *SE* = 0.01, $p < 0.01$). Thus, there is a mutual predictive effect between rumination and self-esteem (as shown in Table 5). To compare the effects of two paths, we conducted a Bootstrap test and found that $\Delta\beta$ = 0.1, with a *95% CI* of [-0.045, 0.025], indicating non-significance. This result suggests that there is no significant difference between the effect of T1 rumination predicting T2 self-esteem and the effect of T1 self-esteem predicting T2 rumination. In summary,

Table 4 *Descriptive statistics and intraclass correlation coefficients (ICC)*

| Variable | Mean | SD | Variance | | Intraclass correlation | Rumination | Self-esteem |
|---|---|---|---|---|---|---|---|
| | | | Within-subject | Between-subject | | | |
| Rumination | 12.36 | 3.42 | 2.74 | 3.30 | 0.59 | 1 | 0.58*** |
| Self-esteem | 25.48 | 5.81 | 6.27 | 14.12 | 0.62 | 0.44*** | 1 |

*Note.* Correlation between rumination and self-esteem within and between group: The lower left corner represents the within-group correlation coefficients and the upper right corner represents the between-group correlation coefficients.

***$p < 0.001$

Table 5 *The relationship between rumination and self-esteem*

| Effect | Variable | Fixed effect *γ (SE)* | Random effect *τ (SE)* |
|---|---|---|---|
| Intercept | Rumination | 11.36 (0.14)*** | 3.36 (0.22)*** |
| | Self-esteem | 22.75 (0.19)*** | 12.89 (1.18)*** |
| Autoregressive effect | T1 rumination→T2 rumination | 0.21 (0.08)*** | 0.04 (0.02)*** |
| | T1 self-esteem→T2 self-esteem | 0.17 (0.03)*** | 0.05 (0.02)*** |
| Cross-lagged effect | T1 rumination→T2 self-esteem | 0.14 (0.04)** | 0.03 (0.01) |
| | T1 self-esteem→T2 rumination | 0.04 (0.01)** | 0.01 (0.00)*** |

*Note.* T1: the previous day; T2: the following day; SE: standard error.
**$p < 0.01$, ***$p < 0.001$

this study demonstrates that there exists a short-term bidirectional predictive relationship between rumination and self-esteem, with no difference in the predictive effects.

## Discussion

This research utilized longitudinal tracking and diary methods to examine the bidirectional influences between rumination and self-esteem. Study 1's findings revealed that initial rumination levels significantly predicted subsequent self-esteem, and, conversely, initial self-esteem levels significantly predicted later rumination. Similarly, Study 2 demonstrated that daily rumination significantly influenced the following day's self-esteem, and prior day's self-esteem significantly predicted the next day's rumination. Overall, by integrating both long-term and short-term tracking approaches, this study comprehensively corroborated the bidirectional predictive relationship between rumination and self-esteem.

### Predictive Role of Rumination on Self-Esteem

Study 1 found that rumination measured at an initial time point negatively predicted self-esteem at a later time point, supporting H1. This result indicates that rumination has a long-term predictive effect on self-esteem.

Rumination, a cognitive process, is a critical predictor of various psychological states, including self-esteem, depression, anxiety, and bipolar affective disorders. It is characterized by maladaptive reflection on distress symptoms and their potential impacts, often resulting in extended negative emotional states. These prolonged negative emotions can gradually diminish an individual's self-esteem, as they tend to internalize these feelings specific to certain situations and generalize them to their overall self-worth (Nolen-Hoeksema, 2000). A longitudinal study by Genet et al. (2012) highlighted a correlation between high levels of rumination at one time point and lower self-esteem at later time points (Genet et al., 2012). This cyclical nature of rumination can lead to a detrimental cycle of decreasing self-esteem, impacting performance across various life domains. Clinical research has demonstrated that cognitive-behavioral therapy (CBT) and mindfulness-based interventions are effective in reducing rumination, thereby improving self-esteem (Watkins, 2008).

Several mechanisms have been proposed to explain the long-term relationship between rumination and self-esteem. One such mechanism is the exacerbation of negative emotional states. Specifically, persistent rumination can intensify negative emotions, thereby eroding self-esteem and amplifying feelings of

helplessness and worthlessness (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Another proposed mechanism is the impairment of problem-solving abilities. Ruminative behavior may absorb significant cognitive resources, diminishing the capacity for positive thinking and effective problem-solving. This can lead to increased feelings of helplessness and despair, further reducing self-esteem (Lyubomirsky & Nolen-Hoeksema, 1995).

Study 2 also revealed a short-term negative predictive effect of rumination on self-esteem; specifically, rumination on one day predicted a decrease in self-esteem the following day, supporting H2. Although research in this area is still developing, a daily diary study by Zawadzki et al. (2013) found that ongoing daily rumination resulted in increased negative emotions the next day, creating a vicious cycle of rumination-negative emotion-self-evaluation (Zawadzki et al., 2013). This study contributes new evidence to the existing body of research, highlighting the predictive impact of daily rumination on self-esteem.

**Predictive Role of Self-Esteem on Rumination**

Study 1 identified that self-esteem serves as a positive predictor of rumination one year later, supporting H3. The cognitive vulnerability model posits that individuals with low self-esteem are more susceptible to rumination due to a cognitive vulnerability. They tend to engage in negative, self-referential thinking, concentrating on their shortcomings and potential threats to their self-worth, which leads to a harmful cycle of low self-esteem and chronic rumination (Orth et al., 2009). Koster et al. further elucidate this bidirectional relationship, showing that individuals with low self-esteem frequently focus on negative self-information, which fosters rumination, and subsequent rumination further decreases self-esteem, creating a self-perpetuating vicious cycle (Koster et al., 2011). From a sociological standpoint, this cycle can be understood within the framework of symbolic interactionism, where an individual's self-concept is shaped through social interactions and the perceived evaluations of others. Those with low self-esteem are particularly sensitive to these societal evaluations, perpetuating the rumination-self-esteem cycle (Joormann et al., 2010).

Study 2 additionally demonstrated that, in a shorter timeframe, self-esteem similarly influences rumination, supporting H4. The mood-congruent memory theory suggests that individuals tend to recall and ruminate on memories that align with their current emotional state. Thus, when experiencing low self-esteem, individuals are more likely to engage in rumination, as they recall memories and thoughts consistent with a negative self-view (Bodoh-Creed et al., 2010). Mor et al. propose that individuals with low self-esteem may struggle with effective emotion regulation, leading them to rely more on rumination as a maladaptive coping mechanism to manage negative emotions in the short term (Mor et al., 2002).

**The Spiral Upward Bidirectional Influence Model of Rumination and Self-Esteem**

This research is pioneering in its use of a dual approach, combining long-term tracking and diary methods, to investigate both the short- and long-term predictive effects between rumination and self-esteem. By synthesizing findings from Study 1 and Study 2, it confirms the bidirectional predictive relationship between these two constructs. To elucidate this relationship, the study introduces the "Spiral Upward Bidirectional Influence Model," grounded in existing theories.

This model suggests a dynamic, reciprocal interaction between rumination and self-es-

teem, capable of spiraling either downwards or upwards. Drawing from cognitive-behavioral theory, it underscores that rumination – characterized by a continuous, passive focus on distressing symptoms and their potential causes and consequences – can gradually undermine an individual's self-esteem. This decline in self-esteem, in turn, exacerbates rumination, creating a self-perpetuating negative cycle. Conversely, positive reflection or intervention can enhance self-esteem, leading to a reduction in rumination and initiating a positive feedback loop.

Socio-cultural theory further complements this model by highlighting the role of external factors such as social comparisons, feedback, and cultural values related to success and failure in modulating the bidirectional influence between rumination and self-esteem (Harré, 2012). Research by Buunk et al. indicates that individuals with low self-esteem tend to engage in negative social comparisons during failures, undermining their self-worth and intensifying rumination (Buunk et al., 2007). Additionally, the influence of cultural values on this dynamic is noteworthy. In collectivist cultures, the emphasis on social and group acceptance significantly affects the rumination-self-esteem pathway (Mendonça et al., 2018; García et al., 2020).

However, this study also has some limitations and areas for improvement. First, the data in this study were obtained through self-reporting, which may be subject to social desirability bias. Future studies could consider using other-report measures or physiological data. Second, previous cross-cultural studies have shown that compared to Western cultures, Eastern cultures place more emphasis on rumination (Mendonça et al., 2018; Wang et al., 2015). Therefore, future research should further investigate whether the current conclusions can be generalized to other cultural groups, conducting cross-cultural studies. Repeatedly, although CLPM provides an effective method for analyzing longitudinal data and exploring relationships between variables, CLPM only considers the temporal stability of variables and fails to adequately consider time-invariant individual differences, which may lead to biased estimates (Hamaker et al., 2015). Therefore, caution should still be exercised when interpreting the ultimate bidirectional predictive relationships. Even with advanced statistical models, it is difficult to completely eliminate all potential confounding variables or to prove causality. Future research could consider employing experimental methods to further elucidate the causal relationship between rumination and self-esteem. Experimental designs allow researchers to manipulate one variable and observe its effect on another variable while controlling for potential confounding factors, thereby providing more robust evidence of causality. Lastly, the derivation of a theoretical model requires multiple measurements and the support of extensive data results. Due to limited research resources, our study only conducted two measurements, each including two time points. In our future research, we will adopt more forms of measurements or experiments to obtain more data results to validate the spiral upward bidirectional influence model of rumination and self-esteem.

## Conclusion

This study, combining long-term tracking and diary methods, explored the bidirectional influences between rumination and self-esteem from a longitudinal perspective. Study 1 utilized a long-term tracking design to conduct a two-wave survey spaced one year apart with 1157 participants. CLPM revealed that rumination measured initially could predict subsequent self-esteem, and initial self-esteem could also predict later rumination. To

reduce recall bias, Study 2 employed a diary method and conducted a continuous 28-day survey with 185 participants. The findings indicated that rumination on one day could predict self-esteem on the following day, and self-esteem on one day could likewise predict rumination on the next day.

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