

Preventing mental health issues: Exploring the influence of physical exercise on rumination and thought suppression

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Abstract: This study explores the moderating role of physical exercise in the relationship between rumination and thought suppression. Using a questionnaire methodology, a survey was conducted on a sample of college students in Gansu Province, China, utilizing self-developed demographic questionnaires, rumination scales, White Bear Suppression Inventory (WBSI), and physical activity level scales. A total of 315 responses were collected online and analyzed using SPSS 26.0. The results indicate significant correlations among rumination, thought suppression, and physical exercise ($p < 0.001$). Rumination positively predicts thought suppression behavior ($\beta = 0.958$, $t = 60.678$, $p < 0.001$), and physical exercise moderates the impact of rumination on thought suppression ($\beta = -0.171$, $t = -5.985$, $p < 0.001$). Higher levels of rumination are associated with increased occurrences of thought suppression, but physical exercise attenuates the negative influence of rumination on thought suppression. These findings suggest the importance of prioritizing physical exercise, and individuals with conditions such as obsession, depression, and anxiety may benefit from incorporating physical exercise into interventions and treatments to reduce thought suppression tendencies and promote overall well-being.

Keywords: Rumination; Thought Suppression; Physical Exercise; Mental Health

1. Introduction

Unwanted thoughts often intrude our minds, causing distress and potentially impacting psychological well-being. In an attempt to avoid dwelling on these unwanted thoughts, individuals may resort to thought suppression (Wegner, 2011). However, although the thoughts were successfully suppressed initially, they resurface more prominently later on. Researchers have termed the former as immediate enhancement effect and the latter as post-suppression rebound effect (Lavy & van den Hout, 1990; Wegner, 2009; Wenzlaff & Wegner, 2000). The existence of these effects indicates that thought suppression may not always effectively reduce unwanted thoughts and could potentially have opposite effects.

Current theories and research widely acknowledge that rumination has negative effects on cognitive mechanisms, including inhibitory control. Rumination leads individuals to dwell in negative emotions, causing them to repeatedly ruminate on past painful situations and feelings even long after the events have ended (Conway, 2000). It can intensify an individual's experience of negative emotions, prolonging their duration and making it challenging to break free from the cycle of negativity (Ando et al., 2020). Whitmer and Gotlib (2013) proposed the attentional scope reduction model of rumination, suggesting that rumination impairs cognitive functioning by narrowing attentional focus. Roberts (2013, 2017), after reviewing theories and studies on inhibition and state rumination, found that rumination consumes attentional resources, weakening an individual's inhibitory capacity and impairing performance on inhibitory control tasks. In experiments inducing rumination, it is observed that state rumination leads to adverse consequences such as reduced problem-solving efficiency, fostering negative attitudes towards oneself and the future, and increasing the recall of painful memories in autobiographical memory (Hasegawa et al., 2021; Watkins & Brown, 2002; Zetsche et al., 2018).

Therefore, rumination not only exacerbates emotional distress but also diminishes an individual's ability to cope with stressful events, making them more prone to feelings of helplessness and entrapment when facing challenges. The higher the frequency of ruminative thoughts, the more likely individuals are

to rely on thought suppression in an attempt to avoid direct emotional experiences (Eisma et al., 2020; Sahib et al., 2024). The negative impacts of rumination on emotions and memory imply that individuals may resort to utilizing more thought suppression strategies (Buerke & Capron, 2024; Hasegawa et al., 2015; Jeong, Lee, & Kwon, 2015; Watkins & Moulds, 2009).

In the unfortunate positive relationship between rumination and thought suppression, efforts are being made to identify factors that can improve this relationship. Both rumination and thought suppression are maladaptive emotion regulation strategies, while physical exercise has been shown to enhance emotional regulation capabilities (Wang, Tian, & Yang, 2023), alleviate negative emotions, and promote self-efficacy in emotional regulation (Tang et al., 2022). Furthermore, physical exercise has positive effects on reducing social anxiety, depression, enhancing mindfulness levels, improving peer relationships, and more (Li et al., 2023; Luo et al., 2024). Additionally, physical exercise has received attention in national fitness programs and policies such as the National Fitness Plan and the Outline of Building a Sports Power. The State Council issued the "National Fitness Plan (2016-2020)" and the "Outline of Building a Sports Power" in 2016, emphasizing the goal of fully establishing a socialist modern sports power by 2050. This includes elevating people's physical literacy, health levels, and overall sports competitiveness to leading positions globally. These policies underscore the significant importance of physical exercise for both physical and mental well-being.

In conclusion, abundant research and theories have demonstrated the close relationship between rumination and inhibitory control. However, the crucial role of physical exercise has been overlooked in studies seeking to reduce tendencies towards thought suppression. Therefore, this study proposes the following hypothesis: physical exercise plays a moderating role in the relationship between rumination and thought suppression.

2. Research Method

2.1 Participants

Using convenience sampling, college students from selected universities in Gansu Province were recruited as participants. Prior to filling out the questionnaires, the voluntary and anonymous nature of the study was explained. The questionnaires were distributed and collected through the Questionnaire Star platform. A total of 315 questionnaires were collected, with 164 male participants (52.06%) and 151 female participants (47.94%). Among the participants, 261 (82.86%) were from urban areas, while 54 (17.14%) were from rural areas. Furthermore, 53 participants (16.83%) were only children, and 262 (83.17%) had siblings.

2.2 Research Tools

2.2.1 Response Styles Questionnaire

The Nolen-Hoeksema Ruminative Responses Scale (RRS), derived from the Response Styles Questionnaire (RSQ) developed by Nolen-Hoeksema and Morrow (1991), was utilized. The Chinese version of this scale was revised by Han Xiu and Yang Hongfei (2009). It consists of 22 items scored on a Likert four-point scale. The scale was validated with Chinese university students during its revision, making it suitable for the target population in this study. The Cronbach's α coefficient for this scale in the current study was 0.968.

2.2.2 White Bear Suppression Inventory (WBSI)

The White Bear Suppression Inventory (WBSI) was initially developed by Wegner and Zanakos (1994) and later translated into Chinese by Zhou Lihua et al. (2012), who examined the questionnaire's applicability in China. The WBSI is a 15-item self-report measure designed to assess an individual's tendency to suppress thoughts. Participants rate each item on a 5-point Likert scale. In this study, the internal consistency coefficient was found to be 0.962.

2.2.3 Physical Activity Level Scale

For the measurement of physical exercise in this study, the Physical Activity Level Scale revised by Liang Deqing (1994) was utilized. This scale is widely used for assessing physical exercise or activity. The scale primarily evaluates participants' exercise levels across three aspects: intensity, duration, and frequency. Each aspect is divided into five levels. Intensity and frequency are scored on a scale of 1 to 5, while duration is rated from 1 to 5, with varying values ranging from 0 to 4 points. The total physical

activity level is calculated as the product of intensity, duration, and frequency (Physical Activity Level = Intensity $\times$ Duration $\times$ Frequency). The internal consistency coefficient for the Physical Activity Level Scale in this study was found to be 0.721.

2.3 Data Analysis

In this study, independent sample t-tests, Pearson correlation analysis, and hierarchical regression analysis were conducted using SPSS 26.0.

3. Results

Table 1: Statistics of basic demography variables and comparison of differences between main variables (N=315)

		<i>N</i>	Ruminate	Physical Exercise	Thought Suppression
			<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>
gender	Man	164	47.585±17.315	38.409±28.031	39.274±16.119
	Woman	151	47.285±17.131	37.457±27.998	39.192±15.786
	<i>t</i>		0.155	0.031	0.046
Place of origin	City	261	45.510±16.290	40.211±28.035	37.037±15.195
	Countryside	54	56.778±18.541	27.037±25.186	48.556±16.277
	<i>t</i>		-4.515***	3.196**	-4.891***
Family formation	Only-child	53	57.491±18.446	26.981±27.994	48.150±16.196
	Not-only child	262	45.408±16.232	40.171±27.496	37.431±15.290
	<i>t</i>		4.827***	-3.176**	4.608***

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; “p” is the probability, reflecting the probability of an event.

Differences in the variables based on gender, place of origin, and family structure were analyzed through independent sample t-tests. Table 1 shows that there were no significant differences in Rumination, Physical Exercise, and Thought Suppression based on gender ($ps > 0.05$). However, significant differences were found in Rumination, Physical Exercise, and Thought Suppression based on place of origin and family structure ($ps < 0.01$). Participants residing in rural areas scored significantly higher on rumination and thought suppression compared to those living in urban areas. Only children scored significantly higher on rumination compared to individuals with siblings, while individuals with siblings scored significantly higher on physical exercise compared to only children.

Table 2: Correlation analysis of main variables (N=315)

	1. gender	2	3	4	5
2. Place of origin	0.019				
3. Family formation	0.024	0.002			
4. Ruminate	-0.009	0.247***	-0.263***		
5. Physical Exercise	-0.017	-0.178**	0.177**	-0.721***	
6. Thought Suppression	0.003	-0.266***	-0.252***	0.965***	-0.733***

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; “p” is the probability, reflecting the probability of an event.

The correlation analysis using Pearson correlation coefficient examined the relationships between variables. As shown in Table 2, place of origin and family structure were significantly correlated with all research variables ($ps < 0.01$). Rumination was significantly negatively correlated with thought suppression ($p < 0.001$) and physical exercise ($p < 0.001$). This indicates that higher levels of rumination are associated with a greater likelihood of engaging in thought suppression behaviors. There was a significant negative correlation between physical exercise and thought suppression, suggesting that higher levels of physical exercise are associated with a reduced likelihood of engaging in thought suppression. Additionally, there was a significant negative correlation between physical exercise and rumination, indicating that lower levels of physical exercise are associated with a higher likelihood of rumination.

Table 3: The moderating effect of physical exercise on the relationship between rumination and thought suppression (N=315)

Models and Variables	Thought Suppression							
	Model 1		Model 2		Model 3		Model 4	
	β	t	β	t	β	t	β	t
1. gender	-0.002	-0.030	0.005	0.356	0.003	0.240	-0.003	-0.221
Place of origin	0.267	5.061***	0.029	1.932	0.030	1.982	0.028	1.998
Family formation	-0.253	-4.787***	0.000	-0.004	-0.001	-0.074	0.002	0.161
2. Ruminate			0.958	60.678***	0.902	41.720***	0.690	16.818***
3. Physical Exercise					-0.077	-3.701***	-0.208	-7.058***
4. Ruminate* Physical Exercise							-0.171	-5.985***
ΔR^2	0.126		0.932		0.935		0.941	
R^2	0.367		0.966		0.967		0.971	
F	16.153***		1075.931***		898.748***		839.335***	

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; “p” is the probability, reflecting the probability of an event.

Utilizing hierarchical regression analysis to test the moderating effect of physical exercise. As shown in Table 3, Model 1 included gender, place of origin, and family structure as control variables. Model 2 introduced the independent variable rumination, Model 3 included the moderator variable physical exercise, and finally, Model 4 incorporated the interaction term between rumination (independent variable) and physical exercise (moderator variable). The results indicate that rumination can predict thought suppression behavior ($\beta = 0.985$, $t = 60.678$, $p < 0.001$), and physical exercise plays a significant moderating role in the relationship between rumination and thought suppression ($\beta = -0.171$, $t = -5.985$, $p < 0.01$). Physical exercise has the ability to weaken the impact of rumination on thought suppression behavior, consistent with the hypothesis.

4. Discussion

This study examined the relationship between rumination and thought suppression. The results indicate a significant positive correlation between rumination and thought suppression behavior among college students. Furthermore, rumination directly and positively predicts thought suppression behavior, suggesting that higher levels of rumination make individuals more prone to engaging in thought suppression, consistent with existing research findings. The beneficial effects of physical exercise were also confirmed in this study. Physical exercise was found to effectively moderate the impact of rumination on thought suppression, attenuating its influence and reducing the occurrence of rumination behavior, thus supporting the hypothesis.

College students are part of a complex social group, which means they often experience emotional breakdowns when facing various pressures and challenges in their lives and studies. This phenomenon is very common among college students, mainly because they face issues such as interpersonal relationships, graduation, and employment, requiring them to take on more responsibilities and stress. These pressures often stem from various aspects of life, study, family, and social interactions (Hurst, Baranik, & Daniel, 2013). As a result, negative emotions are more likely to emerge in college students due to the complexity of their environment. Rumination becomes a primary manifestation of these unresolved emotions. Engaging in physical exercise can provide college students with an outlet for releasing pent-up emotions, reducing stress, improving relationships, and facilitating better integration into the community. Participating in sports not only allows individuals to learn various physical skills and enhance their physical fitness but also helps strengthen their moral character and social skills, enabling the development of a sound personality to better adapt to society (Li et al., 2023; Luo et al., 2024; Salmon, 2001). Individuals are currently facing various life pressures and experiencing negative emotions as a common occurrence. Recognizing the importance of physical exercise and utilizing it as an essential method to improve negative emotions can help individuals better cope with societal challenges and alleviate stress in life and work. This study explored the relationship between rumination and thought suppression using physical exercise volume as a moderating variable. The results indicate that physical exercise serves as a protective factor for thought suppression. Increasing physical exercise can effectively reduce rumination, weaken its impact on thought suppression behavior, and potentially reduce the negative emotions and psychological issues associated with rumination. This insight suggests that individuals can decrease the likelihood of rumination by engaging in sports activities, increasing opportunities for physical exercise, and fostering positive attitudes toward exercise. This approach can help protect individual mental health and promote a positive atmosphere conducive to well-being.

Therefore, the article suggests the following specific measures to promote physical exercise at the individual, school, and societal levels:

Individual Level: (a). Set specific goals: Clearly define exercise objectives and quantifiable indicators for assessing effectiveness. (b). Choose suitable activities: Select appropriate sports activities based on personal interests and physical fitness levels, such as walking, running, swimming, yoga, etc. (c). Maintain regular exercise: Engage in aerobic exercise three to five times a week for at least 30 minutes each time, such as brisk walking or jogging, to alleviate anxiety and depression.

School Level: (a). Organize group activities: Regularly arrange collective exercise activities to enhance students' physical fitness and promote class and school cohesion. (b). Provide facility support: Offer fitness facilities on campus or nearby, such as gyms, treadmills, etc., to allow students to exercise at any time conveniently. (c). Flexible study schedule: Arrange study time reasonably to ensure that students have sufficient time for physical exercise, enabling them to engage in exercise during non-study hours.

Social Level: (a) Increase government and community investment in public sports facilities to enhance sports infrastructure development. (b) Organize various sports events and activities to inspire public participation in sports and raise awareness of national fitness. (c) Offer scientific fitness guidance and health lectures to help individuals learn the correct exercise methods and prevent sports injuries.

By the collective efforts of individuals, schools, and society, the promotion of physical exercise can be advanced, thereby alleviating the negative impact of life and study pressures on college students. Individuals can actively engage in sports activities, schools can provide more opportunities and resources for physical exercise, and society can support and promote individual physical exercise through initiatives such as promoting the importance of sports exercise and enhancing sports competition systems. Publicity by society and the media is crucial in raising awareness about the importance of physical exercise. Additionally, improving and diversifying sports competition systems to offer more participation opportunities for college students can stimulate their interest in sports activities. Furthermore, society should employ various approaches to encourage individuals to participate in physical exercise, such as implementing fitness programs tailored to specific needs and encouraging individuals to incorporate sports into their daily lives. Through these efforts, the enthusiasm and initiative of college students to engage in physical exercise can be effectively enhanced, helping them better manage stress and emotions while maintaining their overall well-being. These comprehensive promotion measures will contribute to fostering a healthier and more positive campus environment, creating a societal atmosphere that values both physical and mental health as well as holistic development.

This study is a cross-sectional study that can only explore associations and cannot establish causal relationships. In future research, experimental methods can be employed to determine the effect of physical exercise on thought suppression more definitively. Additionally, exploring individual differences during physical exercise, specifically investigating how physical exercise affects thought suppression in different groups, could be considered as a potential avenue for further research.

5. Conclusion

Rumination positively predicts individual thought suppression, with higher levels of rumination potentially indicating a greater tendency towards thought suppression. Physical exercise plays a moderating role in the relationship between rumination and thought suppression, to some extent weakening the positive association between rumination and thought suppression. This may help alleviate the tendency towards thought suppression and mitigate its negative consequences. These findings underscore the importance of emphasizing physical exercise. In related intervention activities, the inclusion of physical exercise or activities could be considered.

References

- [1] Ando, A., Giromini, L., Ales, F., & Zennaro, A. (2020). A multimethod assessment to study the relationship between rumination and gender differences. *Scandinavian journal of psychology*, 61(6), 740-750.
- [2] Buerke, M., & Capron, D. W. (2024). Brooding, reflection, and anger rumination relate to suicidal ideation through the role of thought control. *Archives of suicide research*, 1-17.
- [3] Conway, M., Csank, P. A., Holm, S. L., & Blake, C. K. (2000). On assessing individual differences in

- rumination on sadness. *Journal of personality assessment*, 75(3), 404-425.
- [4] Eisma, M. C., Boelen, P. A., & Lenferink, L. I. (2020). Prolonged grief disorder following the Coronavirus (COVID-19) pandemic. *Psychiatry research*, 288, 113031.
- [5] Erskine, J. A., Kvavilashvili, L., & Kornbrot, D. E. (2007). The predictors of thought suppression in young and old adults: Effects of rumination, anxiety, and other variables. *Personality and Individual Differences*, 42(6), 1047-1057.
- [6] Hasegawa, A., Somatori, K., Nishimura, H., Hattori, Y., & Kunisato, Y. (2021). Depression, rumination, and impulsive action: A latent variable approach to behavioral impulsivity. *The Journal of Psychology*, 155(8), 717-737.
- [7] Hurst, C. S., Baranik, L. E., & Daniel, F. (2013). College student stressors: A review of the qualitative research. *Stress and Health*, 29(4), 275-285.
- [8] Kwon, H. T., Jeong, H. K., Lee, A. S., An, H. S., & Lee, J. S. (2015). Heteroepitaxially grown zeolitic imidazolate framework membranes with unprecedented propylene/propane separation performances. *Journal of the American Chemical Society*, 137(38), 12304-12311.
- [9] Lavy, E. H., & Van den Hout, M. A. (1990). Thought suppression induces intrusions. *Behavioural and Cognitive Psychotherapy*, 18(4), 251-258.
- [10] Li, J., Wang, H., Chen, D., Yu, S., Ding, P., Mai, H., ... & Chen, T. (2023). The positive significance of government-organized nationwide sports events in the post-epidemic era: The impact on citizens' psychological well-being, mindfulness level, and social avoidance distress. *Revista de Psicología del Deporte (Journal of Sport Psychology)*, 32(2), 134-146.
- [11] Luo, T., Mai, H., Yu, S., Wang, H., & Su, W. (2024). The Impact of Physical Exercise on Prosocial Behaviour among College Students. *Revista de Psicología del Deporte (Journal of Sport Psychology)*, 33(3), 323-333.
- [12] Roberts, H. W. (2013). *Rumination and cognitive inhibition*. University of Exeter (United Kingdom).
- [13] Roberts, H., Watkins, E. R., & Wills, A. J. (2017). Does rumination cause "inhibitory" deficits?. *Psychopathology Review*, 4(3), 341-376. DOI: 10.5127/pr.036914
- [14] Sahib, A., Chen, J., Cárdenas, D., Caele, A. L., & Wilson, C. (2024). Emotion regulation mediates the relation between intolerance of uncertainty and emotion difficulties: A longitudinal investigation. *Journal of Affective Disorders*, 364, 194-204.
- [15] Salmon, P. (2001). Effects of physical exercise on anxiety, depression, and sensitivity to stress: a unifying theory. *Clinical psychology review*, 21(1), 33-61.
- [16] Tang, S., Chen, H., Wang, L., Lu, T., & Yan, J. (2022). The relationship between physical exercise and negative emotions in college students in the post-epidemic era: the mediating role of emotion regulation self-efficacy. *International Journal of Environmental Research and Public Health*, 19(19), 12166.
- [17] Wang, Y., Tian, J., & Yang, Q. (2023). Tai Chi exercise improves working memory capacity and emotion regulation ability. *Frontiers in Psychology*, 14, 1047544.
- [18] Watkins, E. R., & Moulds, M. L. (2009). Thought control strategies, thought suppression, and rumination in depression. *International Journal of Cognitive Therapy*, 2(3), 235-251.
- [19] Watkins, E., & Brown, R. G. (2002). Rumination and executive function in depression: An experimental study. *Journal of Neurology, Neurosurgery & Psychiatry*, 72(3), 400-402.
- [20] Wegner, D. M. (2009). How to think, say, or do precisely the worst thing for any occasion. *Science*, 325(5936), 48-50.
- [21] Wegner, D. M. (2011). Setting free the bears: escape from thought suppression. *American Psychologist*, 66(8), 671.
- [22] Wegner, D. M., Schneider, D. J., Carter, S. R., & White, T. L. (1987). Paradoxical effects of thought suppression. *Journal of personality and social psychology*, 53(1), 5. DOI: 10.1037/0022-3514.53.1.5
- [23] Wenzlaff, R. M., & Wegner, D. M. (2000). Thought suppression. *Annual review of psychology*, 51(1), 59-91.
- [24] Whitmer, A. J., & Gotlib, I. H. (2012). Switching and backward inhibition in major depressive disorder: the role of rumination. *Journal of abnormal psychology*, 121(3), 570.
- [25] Zetsche, U., Bürkner, P. C., & Schulze, L. (2018). Shedding light on the association between repetitive negative thinking and deficits in cognitive control—A meta-analysis. *Clinical psychology review*, 63, 56-65.